Diane Roy
Director, Regulatory Services

Gas Regulatory Affairs Correspondence
Email: gas.regulatory.affairs@fortisbc.com

Electric Regulatory Affairs Correspondence
Email: electricity.regulatory.affairs@fortisbc.com

FortisBC
16705 Fraser Highway
Surrey, B.C. V4N 0E8
Tel: (604) 576-7349
Cell: (604) 908-2790
Fax: (604) 576-7074
Email: diane.roy@fortisbc.com
www.fortisbc.com

August 8, 2016

British Columbia Utilities Commission
6th Floor, 900 Howe Street
Vancouver, BC
V6Z 2N3

Attention: Ms. Laurel Ross, Acting Commission Secretary and Director

Dear Ms. Ross:

Re: FortisBC Inc. (FBC)

Application for Acceptance of Demand Side Management (DSM) Expenditures for 2017

Pursuant to section 44.2(3) of the *Utilities Commission Act*, FBC applies to the British Columbia Utilities Commission for acceptance of DSM expenditures for 2017.

If further information is required, please contact Joyce Martin, Manager Regulatory Affairs at (250) 368-0319.

Sincerely,

FORTISBC INC.

Original signed:

Diane Roy

Attachments

FortisBC Inc.

Application for Acceptance of Demand Side Management Expenditures for 2017

August 8, 2016

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1. INTRODUCTION

The Application for Acceptance of Demand Side Management (DSM) Expenditures for 2017 (2017 DSM Application or the Application) outlines FortisBC Inc.'s (FBC or the Company) request pursuant to section 44.2 of the *Utilities Commission Act* (UCA or the Act) for acceptance of DSM expenditures of $7.6 million for the year 2017. The funding request outlined in this Application is supported by a detailed 2017 DSM Plan, found in Appendix A. The 2017 DSM Plan provides details on each of FBC's program areas and individual DSM programs, including cost-effectiveness test results.

In its acceptance of the Company's 2015-16 DSM Plan, section 6.3 of the Commission's Decision and Order G-186-14 (2015-16 DSM Plan Decision) stated:

> The Commission Panel encourages FBC to file its next multi-year DSM expenditure schedule after the Commission's review and decision on the 2016 LTRP.
>
> The Commission Panel recognises that there may be insufficient time between FBC's LTRP decision and the end of 2015 (sic) to obtain acceptance of a new DSM expenditure schedule. In that case, the Commission Panel encourages FBC to file for acceptance of a shorter DSM period (i.e. for 2017 only) in order to bridge the gap. However, FBC would still be expected to incorporate the results of the latest CPR in this filing where possible.

The Company intends to include a new Long Term DSM Plan (2016 LT DSM Plan) as part of the 2016 Long Term Electric Resource Plan (LTERP) which will be filed on or before November 30, 2016. The provincial dual-fuel Conservation Potential Review (BC CPR) is currently underway jointly by FortisBC Energy Inc. (FEI), British Columbia Hydro and Power Authority (BC Hydro) and FBC, and will inform the new Long-Term DSM Plan. Since the BC CPR report is not final, and FBC is seeking acceptance of the DSM expenditure schedule for 2017 only as suggested by the Commission, no BC CPR results have been incorporated in this filing.

The proposed 2017 DSM Plan is comparable in the level of expenditures and the cost-effectiveness of the programs to the previously accepted 2015-2016 DSM Plan. The requested DSM expenditures in 2017 of $7.6 million is comparable to approved expenditures in 2015 and 2016 of $7.3 and $7.5 million, respectively.

The most recent results (energy savings, expenditures, benefit/cost ratios), with respect to the 2015-2016 DSM Plan, are found in FBC's 2015 DSM Year-End Report (2015 DSM Report), included as Appendix B. The 2015 DSM Report describes the results of FBC's 2015 Conservation and Energy Management (C&EM) (formerly known as PowerSense) programs, most of which FBC is proposing to continue for 2017.

For the purposes of calculating the cost-effectiveness of the DSM programs, this filing uses a Long-Run Marginal Cost (LRMC) of $112 per MWh from FBC's 2012 Long Term Resource Plan

(2012 LTRP)[1], as accepted in the 2015-16 DSM Plan Decision. The LRMC will be updated in the Company's 2016 LTERP.

Also for the calculation of benefits, the Company has updated the Deferred Capital Expenditure (DCE) factor, and the study supporting the new DCE factor is included as Appendix C. As described further in section 5.1.2, the 2017 DSM Plan uses a DCE of $79.85 per kW-year.

As explained in this Application, the proposed 2017 DSM Plan expenditures are cost-effective, fulfil the adequacy requirements of the DSM Regulation[2], and are in the public interest.

[1] The 2012 LTRP was filed as part of FBC's 2012-2013 Revenue Requirements Application and Review of the 2012 Integrated System Plan.
[2] Demand-Side Measures Regulation 326/2008, as amended by B.C. Reg. 141/2014.

2. BACKGROUND

2.1 *LEGAL FRAMEWORK*

FBC is filing the proposed DSM Plan for 2017 pursuant to section 44.2(1)(a) of the UCA, which provides that a utility may file "a statement of the expenditures on demand-side measures the public utility has made or anticipates making during the period addressed by the utility." All proposed activity in FBC's 2017 DSM Plan qualifies as "demand side measures" as defined under the *Clean Energy Act* (CEA)[3]. Section 44.2(2) of the UCA provides that the Commission must accept a schedule of demand-side measure expenditures before including those expenditures in rates.

Pursuant to section 44.2(3) and (4), the Commission must accept all (or a part of) the DSM expenditure schedule if it considers the schedule (or a part of it) to be in the public interest. In considering whether an expenditure schedule put forward by a non-Crown public utility is in the public interest, the Commission must consider the following criteria according to section 44.2(5):

- the applicable of British Columbia's energy objectives;
- the most recent long-term resource plan filed by the public utility under section 44.1, if any;
- if the schedule includes expenditures on demand-side measures, whether the demand-side measures are cost-effective within the meaning prescribed by regulation, if any; and
- the interests of persons in British Columbia who receive or may receive service from the public utility.

The ways in which FBC's proposals support the applicable energy objectives are addressed in Section 2.2. Consistency with the Company's most recent LTRP is addressed in Section 2.3. The consideration of adequacy, as defined in the DSM Regulation, is discussed in Section 2.4, meeting the 2015-16 DSM Plan Decision Directives are referenced in Section 2.5 and the consideration of cost-effectiveness of the expenditure schedule is addressed in Section 5.1. The discussion in this Application and supporting materials confirms that FBC's proposals further the interests of persons in British Columbia who receive or may receive service from the public utility.

2.2 *CONSISTENCY WITH BRITISH COLUMBIA ENERGY OBJECTIVES*

British Columbia's energy objectives are defined and set out in section 2 of the CEA. The applicable energy objectives and how FBC's proposals support those objectives are summarized in the table below.

[3] *Clean Energy Act* [SBC 2010] Chapter 22 Definitions 1. (1)

Table 2-1: BC's Energy Objectives Met by FBC DSM Activity

Energy Objective	FBC DSM Portfolio
(b) to take demand-side measures and to conserve energy…	FBC's DSM proposals are designed to implement cost-effective (as defined by the DSM Regulation) demand-side measures. See Section 5.
(d) to use and foster the development in British Columbia of innovative technologies that support energy conservation and efficiency and the use of clean or renewable resources;	FBC supports pilot projects of new DSM technologies, and the DSM Plan allows new measures to be incented if B/C ratio is positive. See Appendix A, section A1.5.
(h) to encourage the switching from one kind of energy source or use to another that decreases greenhouse gas emissions in British Columbia;	The BC CPR will examine the fuel switching potential and its cost-effectiveness. FBC does not have a fuel switching program at this time.
(i) to encourage communities to reduce greenhouse gas emissions and use energy efficiently;	Local government & institutional strategic energy planning, and Community Education & Outreach, are enabled through supporting initiatives. Qualifying projects are incented within applicable programs, including energy assessment funding. See Section 2.4.3 and Appendix A, section A4.4.

2.3 CONSISTENCY WITH LONG TERM RESOURCE PLAN

Under section 44.2 of the UCA, the Commission, in considering whether to accept an expenditure schedule by a utility, must consider the utility's most recent long-term resource plan filed under section 44.1 of the Act. For FBC, the current 2012 LTRP was accepted by the Commission in August 2012.[4] The measures in the 2017 DSM Plan are consistent with the measures assessed and the benefit/cost methodology used in the 2012 LTRP, and the Commission's directives[5] regarding that Plan. More specifically, the number and breadth of DSM measures and programs that pass the Total Resource Cost (TRC) test[6], is similar to that projected in the 2012 LTRP (and approved for the 2015-16 DSM Plan).

The 2012 Long Term DSM Plan[7], which was a component of the Company's 2012 LTRP, indicated a LRMC, based on BC "clean and renewable" resources, of $111.96/MWh (nominally $112/MWh). FBC's use of a BC "clean and renewable" LRMC was subsequently specified in the 2014 DSM Regulation amendment. In the 2017 DSM Plan, the Company continues to use $112/MWh as the LRMC, as was approved for the 2015-16 DSM Plan. The 2016 LTERP will develop a FBC-specific LRMC for DSM purposes that will be used in the new Long Term DSM Plan and potentially in subsequent expenditure schedule filings.

[4] FortisBC 2012 Integrated System Plan, Volume 2
[5] BCUC Order G-110-12
[6] The TRC test is the ratio of the benefits of a DSM measure divided by the DSM measure's cost, including the utility's program costs. The TRC is further described in Section 5.1.2.
[7] FortisBC 2012 Integrated System Plan, Volume 2

Recent BC Hydro proceedings[8] indicate its LRMC is $106/MWh which is similar in magnitude to the $112/MWh that FBC is using for the 2017 DSM Plan.

2.4 *ADEQUACY PURSUANT TO THE DSM REGULATION*

A public utility's plan portfolio is adequate for the purposes of section 44.1(8)(c) of the UCA regarding long-term resource plans, only if the plan portfolio includes all of the following, as set out in section 3 of the DSM Regulation:

a) a demand-side measure intended specifically to assist residents of low-income households to reduce their energy consumption;
b) a demand-side measure intended specifically to improve the energy efficiency of rental accommodations;
c) an education program for students enrolled in schools in the public utility's service area; and
d) an education program for students enrolled in post-secondary institutions in the public utility's service area.

The Company addresses each of these adequacy provisions below. More details on each program are found in the 2017 DSM Plan.

2.4.1 Low Income Program

The low income program is designed to meet the needs of the low income customers within the Company's service areas and is provided at no cost to eligible low income participants. It is offered in collaboration with FEI and BC Hydro to ensure consistency and delivery of best practices.

The 2014 DSM Regulation amendments for low income programs included the following:

1. raising the Low Income Cut-Off (LICO) income eligibility threshold to 130% of the nominal values published by Statistics Canada;
2. deeming recipients of various government income and housing assistance programs eligible; and
3. increasing the TRC benefit calculations to 140% of nominal avoided costs.

The Low Income Program portfolio includes Energy Saving Kits (ESKs) (both mail-out and bulk distribution), and the collaborative BC Hydro and FortisBC Energy Conservation Assistance Program (ECAP) for single-family and housing society operated multi-unit residential buildings (MURB). Qualifying housing society buildings can also access the Commercial MURB rebate

[8] BC Hydro 2015 Rate Design Application, Evidentiary Update on Load Resource Balance and Long Run Marginal Cost. Conclusion Section. Page 9. February 18, 2016.

programs with a 40 percent incentive increase (to address affordability issues) for common area improvements.

2.4.2 Rental Accommodations

In 2016, FBC, in collaboration with FEI, launched a direct-install program with measures such as low flow fixtures and ENERGY STAR lighting products for rental MURB suites in its service territory. The program also provides no cost whole-building energy assessments to identify additional measures (common area lighting, central space heating and hot water boilers) that could be undertaken by the building owners, and provides two years of technical support and access to the FBC Commercial rebate programs. The 2017 DSM Plan continues this offer to MURBs in this target segment.

2.4.3 Education Programs

FBC, in collaboration with FEI, is developing an online education program that supports the development of energy education in BC classrooms. It will provide high quality, engaging, curriculum-connected resources and programs that highlight the BC energy environment and encourage a bias-balanced development of energy literacy in classrooms for kindergarten to grade 9 students. FBC plans to implement the initial pilot phase in 2016 and expects to expand the education program to grades 10-12 in 2017. In addition, FBC will provide funding support for several third party non-profit educational organizations to deliver conservation messaging.

FBC also provides financial and in-kind support for post-secondary initiatives for curriculum-based classroom instruction and broader campus-wide behaviour change programs.

2.5 *BCUC DIRECTIVES*

In the 2015-16 DSM Plan Decision, the Commission provided a number of directives to be addressed for the next DSM expenditure plan. Table 2.5 below provides a list of the 2015-16 DSM Plan Decision Directives related to the 2017 DSM Plan, and references where this Application addresses them.

Other 2015-16 DSM Plan Decision directives have either already been addressed in Annual Report(s), or will be addressed in the 2016 LT DSM Plan to be filed with the 2016 LTERP.

Table 2-2: BCUC Directives from 2015-16 DSM Plan Decision

N°.	Directive	Reference
3.	**The Panel directs FBC to include in the next DSM expenditure request a description of the assumptions used to develop the updated avoided capacity and LRMC estimate, and to explain how avoided transmission and distribution energy losses are incorporated into DSM cost/benefit tests**.	s5.1.2 Appendix C
4.	**The Panel directs FBC to include in each DSM expenditure request spillover and free rider effects assumed for each DSM program, and the justification used to support these estimates.**	Table 6.2
5.	**The Panel therefore directs FBC to review the TRC discount rate assumptions in the next DSM expenditure request, including identification of potential additional DSM measures that would pass both the TRC and the UCT if a societal discount rate was used for the TRC. FBC is also directed to identify in the next DSM expenditure request any DSM measures (in addition to those proposed) that fail the TRC but would pass the mTRC.**	s5.1.2
9.	**As a result, the Panel directs FBC to include in the next DSM expenditure request:** • **an update on FBC's investigation into potential fuel switching programs, including those targeting vehicles and propane/oil heating; and** • **a cost-benefit analysis (including supporting assumptions) showing whether FBC can allow customers with gas as their primary heating source to access FBC's DSM programs and still be compliant with the DSM Regulations.**	Table 2.1
20.	**FBC is directed to include in the next DSM expenditure filing an update on how it ensures EM&V is free of conflicts of interest**.	s6.3

2.5.1 Self-Generation Customers

In its Stage I Decision and Order G-27-16 on FBC's Self-Generation Policy Application, the Commission Panel stated[9]:

> …[T]he Panel encourages FortisBC to address demand side measurement (DSM) programs for self-generation customers as part of its next resource plan and or its next DSM Expenditure filing.

FBC confirms that DSM programs for self-generation customers will be addressed in the 2016 LT DSM Plan. In the interim, the scope of the BC CPR includes accessing the Economic potential of the self-generating customers' total load (self-generation plus FBC sales).

[9] At page (iii) of Decision and Order G-27-16.

3. APPROVAL SOUGHT AND PROPOSED REGULATORY PROCESS

FBC seeks an order pursuant to section 44.2(3) of the UCA Act that the 2017 DSM Expenditure Schedule, which includes up to $7.6 million of expenditures in 2017, is accepted. A draft Order is attached as Appendix D.

The 2017 DSM Plan is a continuation of the expenditures and cost-effective programs previously accepted in the 2015-16 DSM Plan. FBC believes that a written public hearing with one round of Information Requests is appropriate for the review of this Application and proposes the following regulatory timetable.

Table 3-1: Proposed Regulatory Timetable

Regulatory Timetable	Date (2016)
Registration of Interveners	Friday, August 26
BCUC Information Request No. 1	Thursday, September 8
Intervener Information Request No. 1	Thursday, September 15
FBC Response to Information Request No. 1 from BCUC and Interveners	Friday, September 30
FBC Final Submission	Wednesday, October 12
Intervener Final Submission	Wednesday, October 19
FBC Reply Submission	Wednesday, October 26

4. SUMMARY OF DSM PLAN AND FUNDING REQUEST

The 2017 DSM Plan (Appendix A) provides program details and projected cost-effectiveness test results by program, sector and at the portfolio level. The following provides summary information.

The DSM Plan covers FBC's funding request for 2017 for major customer sectors and program areas: Residential (including Low Income and Rental), Commercial (including Irrigation), Industrial, Supporting Initiatives, and Planning and Evaluation.

A single year funding approval is being requested to span the period until the 2016 LTERP filing is accepted, that will include a LT DSM Plan supported by the multi-utility, dual-fuel BC CPR currently underway. FBC expects that the 2016 LT DSM Plan will form the basis for future DSM expenditures beginning in 2018.

The proposed 2017 DSM Plan is a continuation of the level of expenditures and cost-effective programs comparable to the previously accepted 2015-16 DSM Plan by Order G-186-14. The programs in this DSM Plan are continuations and/or augmentations where appropriate, of previous programs that FBC is currently implementing, and has reported on in its prior DSM Reports.

FBC requests acceptance of DSM expenditures of up to $7.6 million in 2017, a level comparable to approved expenditures in 2015 and 2016 of $7.3 million and $7.5 million respectively. In its Decision for the 2015-16 DSM Plan the Commission determination was:

> **The Panel finds that FBC's DSM expenditure request for 2015-16 is reasonably consistent with the 2012 LTRP.**

4.1 *FUNDING REQUEST BY PROGRAM AREA*

FBC's 2016 Approved and Projected expenditures (savings and costs) and TRC results, the 2017 Plan savings and costs and benefit/cost ratios for each of the sectors, program areas and at the portfolio level are outlined in the Table 4-1 below:

Table 4-1: FBC DSM Expenditures & Savings – 2016 Approved/Projected and 2017 Plan

	Program Area	2016 Approved		2016 Projected		2017 Plan		
		Savings MWh	Cost ($000s)	Savings MWh	Cost ($000s)	Savings MWh	Cost ($000s)	TRC B/C ratio
1	**Programs by Sector**							
2	Residential	12,909	3,349	7,098	2,607	10,493	2,718	2.5
3	Commercial	12,695	2,564	11,734	2,547	13,666	3,131	2.2
4	Industrial	1,585	209	2,327	330	1,556	309	1.9
5	**Subtotal Programs**	**27,189**	**6,122**	**21,160**	**5,484**	**25,715**	**6,158**	**2.3**
6	Supporting Initiatives		675		678		674	
7	Planning & Evaluation		737		675		777	
8	**Total (including Portfolio spend)**		**7,534**		**6,838**		**7,610**	**2.0**

The 2016 Projected expenditures of $6.8 million represent slightly over 90% of the annual approved spending under the 2015-2016 DSM Plan, a substantial increase over 2015 results due to the Company's efforts to rebuild customer and trade ally awareness, additional staffing capacity and the successful launch of new offers such as the Business Direct Install (BDI) program, that replaced the successful FLIP (Fortis LiveSmartBC Lighting Installation program) that ended in March 2013.

The 2017 DSM Plan energy savings target has projected a decrease of 2,416 MWh from the 2015-16 DSM Plan in the Residential sector due to:

- declining opportunities for energy savings as provincial and/or federal regulations phase out less efficient baseline products such as incandescent light bulbs, and mandate higher "Energy Star" performance levels for major household appliances and electronics;
- BC Building Code amendments[10] that raised the baseline prescriptive requirements for new home construction; and
- lower home retrofit activity reflecting the end of multi-layer offers, such as the LiveSmartBC program.

The energy savings target has risen by 971 MWh in the Commercial sector due to the escalating market response to program offers and the inclusion of the measures related to the common areas of MURBs.

The Industrial sector energy savings projection for 2016 includes the second portion of a major sawmill modernization project. The 2017 savings target does not anticipate any such extraordinary projects. However the 2017 Industrial Plan expenditure has been increased to allow for energy assessments and a higher incentive rate on qualifying industrial projects.

The planned DSM expenditures for 2017 are provided in more detail by sector and program area in the 2017 DSM Plan (Appendix A).

4.2 *DSM PROGRAMS*

The DSM programs listed in the 2017 DSM Plan are largely continuations, or enhancements, of existing programs included in the 2015-16 DSM Plan for which expenditures have been accepted by the Commission.

Further details for each program can be found in the 2017 DSM Plan (Appendix A).

[10] https://news.gov.bc.ca/stories/updates-to-bc-building-code-take-effect-in-december Effective Dec 19th, 2014.

4.3 DSM GUIDING PRINCIPLES

The 2012 LT DSM Plan was created using the following guiding principles[11]:

1. The DSM Plan will be customer-focused by offering a range of measure choices within programs that address the key end-uses of the principal customer rate classes;
2. The DSM Plan will be cost-effective by including only those measures, with the exception of prescribed measures, which have a TRC Benefit Cost ratio greater than unity on a portfolio basis;
3. The DSM Plan will be inclusive of best practices in terms of program design, implementation, marketing, outreach, monitoring and evaluation; and
4. The DSM Plan will be compliant with the applicable sections of the Utilities Commission Act and the Clean Energy Act, and with the DSM Regulation as amended.

FBC continues to be guided by these principles in designing and carrying out the 2017 DSM Plan.

[11] 2012 Long Term Demand-Side Management Plan s2.1. Accepted under BCUC Order G-110-12.

5. COST EFFECTIVENESS APPROACH

5.1 COST-EFFECTIVENESS UNDER THE DEMAND-SIDE MEASURES REGULATION

FBC's proposed DSM portfolio for 2017 is cost-effective according to the methodology of section 4 of the DSM Regulation. As shown in the 2017 DSM Plan, evidenced by Table 4-1 above, the DSM Plan on a portfolio basis passes the Total Resource Cost (TRC) test as it has a benefit to cost ratio greater than unity (1.0).

The following discussion explains aspects of the TRC cost-effectiveness tests and shows that the 2017 DSM Plan also meets the requirements of the provincial DSM Regulation. The current approach to determining the cost-effectiveness of FBC's DSM programs is comprehensive, benefits customers and should be carried forward through the 2017 test period.

The relevant parameters set out in the DSM Regulation are summarized below. Other considerations for determining the cost-effectiveness of the Company's DSM Plan are discussed in Section 6.

5.1.1 Portfolio-Level Analysis

Section 4(1) of the DSM Regulation stipulates that the Commission, in determining the cost-effectiveness of a demand-side measure proposed in an expenditure portfolio or a plan portfolio, may assess the costs and benefits of (a) a demand-side measure individually, (b) with other demand-side measures in the portfolio or (c) the portfolio as a whole.

The Commission has historically considered the cost-effectiveness of FBC's DSM plans at the portfolio level. In its Decision on FBC's 2012-13 Revenue Requirements Application the Commission stated:

> Regarding the cost effectiveness of the DSM programs, the Commission has previously assessed FortisBC's DSM programming at a portfolio level and will continue to do so in this case.[12]

In its Decision concerning FBC's 2015-2016 DSM Expenditure Schedule, the Commission confirmed this approach:

> In undertaking this review, the Commission Panel approached it on a holistic basis, considering the entire DSM portfolio."[13] The Commission recognized that [The portfolio approach] provides FBC with the flexibility to undertake programs that are expected to provide a net BC benefit but where energy savings are hard to measure or low in the

[12] Order G-110-12, page 136
[13] Order G-186-14, page 4

> short term, provided there are other programs in its portfolio that provide offsetting benefits and/or savings. [14]

FBC's DSM portfolio as set out in the 2017 DSM Plan meets the cost-effectiveness test under the DSM Regulation. FBC notes that the key input assumption, namely the LRMC, contained in the 2017 DSM Plan is consistent with the value used in the 2015-2016 DSM Plan. Of the two other primary inputs, the DCE factor has increased in value and the Discount Rate is lower. These both act to increase the cost-effectiveness of the 2017 DSM Plan. FBC will continue to report on individual DSM program cost-effectiveness results in its Annual Reports, and individual program cost-effectiveness projections are also provided in the 2017 DSM Plan (Appendix A).

5.1.2 Total Resource Cost (TRC) Test

The governing TRC test is generally expressed as a ratio of the benefits of a DSM measure divided by the measure's cost, including the utility's program costs. The benefits are the "avoided costs", calculated as the present value over the effective measure life of:

i. the measure's energy savings, valued at the LRMC; and
ii. the measure's demand savings, valued at the DCE.

The measures' energy & demand savings are grossed-up by the avoided transmission and distribution energy losses (AKA "line losses") before the benefits are calculated.

In this 2017 DSM Plan, the Company references the LRMC of $112 per MWh from its 2012 LTRP, and as used for the 2015-16 DSM Plan. An updated FBC-specific LRMC is in development and will be filed as part of the 2016 LTERP.

In response to Directive 3 of the 2015-16 DSM Plan Decision (see Table 2.5 above), the Company reviewed the assumptions underlying the previous DCE value ($35.60 per kW-year), and commissioned a study to update it. The updated DCE study, which is filed as Appendix C, reviewed the methodologies and best practices to determine a utility specific DCE value and determined a new value based on the present value of the anticipated growth related transmission and distribution capital upgrades over the planning horizon. The study determined a DCE value of $79.85[15] per kW-yr, which is used for this Application.

As required by the 2015-16 DSM Plan decision (Directive 5), the Company reviewed the 8% discount rate (DR) used in the 2012 LTRP and recent DSM filings, and has updated it to use a 6% DR in the current filing. Since all measures passed at the 6% DR, there are no additional measures available if a "societal" discount rate is used.

Section 4 of the DSM Regulation requires that at least 90 percent of FBC's DSM funding be evaluated using the TRC test, and the remainder evaluated using the modified TRC (mTRC)

[14] Decision, page 4.
[15] Appendix C, Deferred Capital Expenditure Study, July 2016. Table 4 (p. 23).

(see Section 5.1.4). The TRC is calculated at the portfolio level by comparing the total costs of the portfolio to the total value of the benefits of the programs contained in the portfolio.

The DSM Regulation also includes special consideration for specified measures (Section 4(4)) and low income programs (Section 4(2)). Specifically, subsection 4(4) of the DSM Regulation states the cost-effectiveness of a *specified* demand-side measure must be determined by the cost effectiveness of the portfolio as a whole. Specified demand-side measures include education programs, energy efficiency training, community engagement programs, technology innovation programs and resources supporting the development of or compliance with energy efficiency standards.[16] FBC has included specified demand-side measures within its Residential and Supporting Initiatives program areas as it did in the 2015-2016 DSM Plan.

For a DSM measure(s) intended specifically to assist residents of low-income households to reduce their energy consumption (which would include the activities within FBC's Low Income Program), the Commission must use, "in addition to any other analysis the Commission considers appropriate", the TRC test and "consider the benefit of the DSM to be 140 percent of its [nominal] value". FBC has applied this approach in the cost-effectiveness analysis of the Low Income programs presented in the 2017 DSM Plan.

5.1.3 Avoided Cost Sensitivity

As stated in the previous section, the 2017 DSM Plan uses the LRMC of $112 per MWh from the 2012 LTRP to determine the avoided energy cost benefits of DSM program measures. The LRMC utilized is considered "firm" energy, i.e. inclusive of generation capacity benefits. The Company also includes a DCE value of $79.85 per kW per year to represent the incremental capacity savings of deferred infrastructure. The estimated Benefit/Cost ratios, using the two figures, are shown at the sector and portfolio levels in Table 4-1 above.

Based on a recent submission,[17] BC Hydro's LRMC is approximately $106/MWh, including energy and capacity, which approximates the $112/MWh value for firm energy (inclusive of capacity) that FBC is utilizing, so no sensitivity runs were undertaken.

5.1.4 Modified Total Resource Cost (mTRC) Test

Amendments to the DSM Regulation in 2014 require that a single LRMC be used to evaluate the Company's DSM energy benefits effective January 1, 2015. Under DSM Regulation s4.(1.1)(c), the modified TRC (mTRC) rules allow for a 15 percent increase for non-energy benefits (NEB), up to a limit of 10 percent of the electricity DSM portfolio expenditure.

There are no measures in the 2017 DSM Plan that require the mTRC cost test in order to pass.

[16] For a more detailed description of specified demand-side measures see Section 1 of the British Columbia Demand-Side Measures Regulation.

[17] BC Hydro. 2015 Rate Design Application. Evidentiary Update on Load Resource Balance and Long Run Marginal Cost. Conclusion Section. February 18, 2016.

5.1.4.1 Inclusion of Non-Energy Benefits (NEBs)

Section 4(1.1)(c) of the DSM Regulation requires the Commission to allow the inclusion of NEBs, the amount of which may be determined either by the Commission based on evidence from the utility or by using a deemed 15 percent increase to the benefits side of the mTRC calculation. FBC uses the latter approach in its mTRC calculations. However, as stated previously, no measures require the inclusion of NEBs in order to pass the TRC cost test.

5.2 ELEMENTS OF THE STANDARD COST BENEFIT TESTS

While the TRC and mTRC continue to be the cost-effectiveness tests that FBC uses to determine the cost-effectiveness of its 2017 DSM Plan on a portfolio basis, the Company has also historically reported and considered a range of other industry standard cost-effectiveness tests, including the Ratepayer Impact Measure (RIM)[18], the Utility Cost Test (UCT)[19] and the Participant Cost Test (PCT)[20] applied at the program, program area (or sector) and portfolio levels. These are consistent with the California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects (California Manual), and will be applied consistently in the 2017 DSM Plan.

The standard test results are shown in Table A6-1 of the 2017 DSM Plan (Appendix A).

[18] The Ratepayer Impact Measure (RIM) test measures what happens to customer bills or rates due to lost utility revenues and recovery of costs caused by the program (incentives + administration) less avoided costs (e.g. power purchase reductions).

[19] Referred to as Program Administrator Cost Test in the California Manual. The Program Administrator Cost Test measures the net costs of a demand side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) less avoided costs e.g. power purchase reductions.

[20] The Participants Test is the measure of the quantifiable benefits (Utility incentive, reduction in utility bills) and costs (principally the Measure cost) to the customer due to participation in a program.

6. EVALUATION, MEASUREMENT & VERIFICATION

Evaluation, Measurement and Verification (EM&V) are important aspects of managing a DSM portfolio. The Company employs Measurement & Verification (M&V) protocols on individual DSM projects, using IPMV[21] best practices, to ensure energy savings estimates are sound. Furthermore, the Company conducts Monitoring & Evaluation (M&E) activities on all programs, with comprehensive impact, process and/or market reviews[22] at appropriate times in the program life cycles. The evaluation results inform program design, and summaries of M&E reports are shared with stakeholders and the Commission through the DSM Annual Reports.

6.1 *MONITORING AND EVALUATION PLAN EXTENSION*

Section A5.1 of the 2017 DSM Plan (Appendix A) proposes a one-year extension to the approved 2015-16 M&E plan to ensure an adequate M&E process remains in place for the duration of the 2017 Plan period. The M&E process will be reviewed in the new Long Term DSM Plan to be filed as part of the 2016 LTERP.

Overall planning & evaluation (P&E) expenditures include costs for EM&V activities. The total proposed expenditure for program EM&V activities to be conducted for 2017 is approximately $375 thousand, or approximately 5% of the DSM portfolio plan expenditure.

6.2 *NET-TO-GROSS RATIO (NTG): SPILL-OVER AND FREE RIDERS*

Historically, FBC calculated the NTG by adjusting the benefits downward for the presumed presence of free riders[23]. Additionally FBC has included known spill-over[24] effects in the NTG, which is a recognized approach that is used by other utilities including BC Hydro As “spill-over” is the conceptual opposite of “free riders”, including both effects presents a more complete and balanced view of program impacts.

FBC will continue to evaluate and quantify free-rider and spill-over effects on a program-by-program basis. Where adequate estimates are developed or acquired based on the results of an evaluation, free rider and spill-over effects will be accounted for in the NTG ratio, as appropriate.

Pursuant to Directive 4 of the Decision approving the 2015-16 DSM Plan, Table 6-1 below lists the free-ridership and spill-over rates currently deployed by FBC.

[21] International Performance Measurement and Verification Protocol® (IPMVP) http://evo-world.org/en/

[22] Types of evaluation activities include: Process evaluations, where surveys and interviews are used to assess customer satisfaction and program success; Impact evaluations, including NTG assessment, to measure the achieved energy savings attributable to the program; and Market reviews to gauge Market Transformation progress.

[23] Individuals who participate in an incentive program who would have the measure even in the absence of an incentive.

[24] Spillover effects involve non-participants who acquired an energy conservation measure (ECM), and who did not receive an incentive, but were influenced by the operation of the utility’s DSM program

Table 6-1: FBC Program Free-Rider and Spill-Over Rates

Program Area	Free-rider	Spill-over	Justification (Source)
Residential			
Home Improvement (Building Envelope) Program	20%		LiveSmart, BC Hydro, Apr 2012
Heat Pump Program	42%	2%	Evergreen Economics, 2014
Heat Pump Water Heater Program	0%		
Water Savers (Low-Flow Fixtures)	0%		Gross savings adjusted based on City Green follow-up surveys
ENERGY STAR® Residential Lighting	36%	77%	Evergreen Economics, May 30, 2014
ENERGY STAR® Appliances	57%	39%	Evergreen Economics, May 30, 2014
New Home Program	20%		as per BC Hydro (Cooper and Habart, 2014)
Rental Accommodation Program	0%		
Commercial			
Commercial Lighting	31%	9%	Evergreen Economics, Mar 2013
Business Direct Install	30% & 31%		Same as for the measures included
Building & Process Improvement Program	30%	12%	BIP Eval Update, Sampson Research, Feb 2012
Custom Lighting	34%		Evergreen Economics, Mar 2013
Building Improvement - New	25%		BIP New Eval, Sampson Research, May 2011
Industrial			
Industrial Efficiency Program	12%		Industrial Evaluation, Sampson Research, Jan 2013
Low Income			
Energy Savings Kit	0%	0%	as per BC Hydro
Energy Conservation Assistance Program	0%	0%	as per BC Hydro

6.3 *AVOIDING EM&V CONFLICT OF INTEREST*

In the Decision on FBC's 2015-16 DSM Plan, the Commission's Directive 20 instructed FBC "to include in the next DSM expenditure filing an update on how it ensures EM&V is free of conflicts of interest".

To ensure the EM&V is free of conflicts of interest, FBC primarily uses independent third-party consultants, who specialize in the evaluation field, to conduct independent analyses of the DSM programs. The consultants are selected through an RFP process to ensure they are qualified and to ensure competitive pricing. The consultant designs and typically undertakes any market research (e.g. participant and trade ally surveys), conducts process and savings impact analysis, and prepares the M&E report, a copy of the executive summary of is filed in FBC's Annual DSM Report.

FBC itself also maintains qualified P&E staff with core EM&V capacity to:

- ensure individual projects are subject to assessment/evaluation by professional engineering staff;
- conduct program research, e.g. participant surveys, for minor studies; and
- manage third party consultants, collect and provide data, and review drafts of major reports.

7. CONCLUSION

This 2017 DSM Plan includes a range of DSM measures and programs and the LRMC of $112/MWh, all of which are consistent with the 2012 LTRP and the previously accepted 2015-16 DSM Plan. The 2017 DSM Plan also includes an updated DCE of $79.85/kW-yr and DR of 6%.

The Company believes that its 2017 DSM Plan, as filed, is in the interests of its customers and is compliant with the relevant provisions of the governing legislation and is cost-effective under the tests stipulated under the legislation. FBC thereby requests that the Commission accept the 2017 DSM expenditures of $7.6 million as filed to support and implement the 2017 DSM Plan.

Appendix A

2017 DSM PLAN

APPENDIX A

2017 Demand-Side Management (DSM) Plan

August 8, 2016

FortisBC Inc.

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APPENDIX A: DEMAND-SIDE MANAGEMENT

Demand-Side Management (DSM) programs have been offered to FBC customers since 1989 and are available to eligible customers served by FortisBC Inc. (FBC or the Company) and its wholesale customers of Grand Forks, Nelson Hydro, Penticton, and Summerland.

The current 2015-16 DSM Plan programs and expenditures received Commission acceptance pursuant to Order G-186-14. The proposed 2017 DSM Plan programs and expenditures continue at approximately the same level of expenditures previously accepted for 2015 and 2016.

The 2017 DSM Plan continues to use the $112/MWh Long Run Marginal Cost (LRMC) as approved in the 2015-16 DSM Plan Decision and Order G-186-14. The LRMC will be updated in the Company's 2016 Long Term Electric Resource Plan (LTERP), to be filed on or before November 30, 2016.

DSM Plan expenditures are $7.6 million in 2017 and are approximately 1% higher than the 2016 accepted expenditure of $7.5 million. All figures in the 2017 DSM Plan are nominal (before tax effect).

The 2017 DSM plan portfolio includes programs for the Residential, Commercial, and Industrial customer classes and is intended to capture economic potential savings over the long term, as identified in the 2013 Conservation Potential Review (CPR) Update[1]. There are also portfolio-level expenditures for supporting initiatives, and planning and evaluation.

The 2017 DSM Plan was developed in compliance with the provincial DSM Regulation, as discussed in the 2017 DSM Application. It includes programs that are mandated to meet the adequacy provisions of the DSM Regulation, namely measures for rental and low income customers, and education (elementary, secondary, and post-secondary schools). The low income program plan expenditures have increased, to better meet the needs of qualified customers.

The DSM Programs described herein, and in the Application, are high-level overviews and/or descriptions of the offers available. The detailed Terms & Conditions for each program take precedence over and govern the actual incentives available, and process required, for qualifying customers.

Table A-1 is a summary table of the proposed 2017 DSM Plan energy savings and expenditures by program sector, for non-program areas and portfolio level totals. The table also presents Total Resource Cost (TRC) Benefit/Cost ratios by program sector and at the portfolio level.

[1] The 2013 CPR update was filed as part of the FBC Application for a Multi-Year Performance Based Ratemaking Plan for 2014-2018 (2014-18 Multi-Year PBR Plan); Attachment to BCUC IR 1.248.2, Exhibit B-7,

Table A-1: 2016 Approved and 2017 DSM Plan Expenditures & Savings

	Program Area	2016 Approved		2017 Plan		
		Savings MWh	Cost ($000s)	Savings MWh	Cost ($000s)	TRC B/C ratio
1	**Sector**					
2	Residential	12,909	3,349	10,493	2,718	2.5
3	Commercial	12,695	2,564	13,666	3,131	2.2
4	Industrial	1,585	209	1,556	309	1.9
5	**Subtotal**	**27,189**	**6,122**	**25,715**	**6,158**	**2.3**
6	Supporting Initiatives		675		674	
7	Planning & Evaluation		737		777	
8	**Total (including Portfolio spend)**		**7,534**		**7,610**	**2.0**

Alternative Benefit/Cost ratios – including the utility cost test (UCT), ratepayer impact measure test (RIM), and participant cost test (PCT) – by program, sector and portfolio level are shown for information purposes in the Summary Table A6-1.

A1 RESIDENTIAL SECTOR PROGRAMS

The DSM Plan focuses on the opportunities in Residential energy retrofits, addressing major end-uses (space heating, hot water and lighting) where the majority of economic potential was identified in the 2013 CPR Update. The following Table A1-1 outlines the list of Residential programs, plan costs and energy savings, and the Benefit/Cost ratio on a Total Resource Cost basis.

A description of each incentive program and the primary delivery mechanisms follows.

Table A1-1: Residential Program Expenditures & Savings

	Program Area	2016 Approved		2017 Plan		
		Savings MWh	Cost ($000s)	Savings MWh	Cost ($000s)	TRC B/C ratio
1	Home Improvement	3,106	884	364	348	1.7
2	Heat Pumps	1,618	302	781	298	1.5
3	New Home	1,179	390	126	151	1.4
4	Lighting	1,547	189	2,735	190	2.2
5	Appliances	288	96	126	133	1.3
6	Water Heating	948	430	17	30	1.5
7	Low Income & Rentals	3,175	952	3,247	1,367	3.4
8	Behavioural	1,048	106	3,097	200	3.7
9	**Total**	**12,909**	**3,349**	**10,493**	**2,718**	**2.5**

A1.1 *HOME IMPROVEMENT*

The main component of the Home Improvement Program (HIP) is building envelope improvements (insulation and air sealing). Program delivery will be primarily through the Home Energy Retrofit Offer (HERO) partnership with FortisBC Energy Inc. (FEI) and BC Hydro. It encourages customers to focus on the appropriate measure sequence up to obtaining a "whole house" EnerGuide rating. Heating/cooling systems (for example, heat pumps) are promoted where applicable but tabulated under a separate plan line item. ENERGY STAR® appliances and lighting are marketed separately, as described below.

A1.2 *HEAT PUMPS*

With its temperate winters and hot summers, the FBC service area is an ideal climate for energy efficient heat pumps. Further, the 2012 Residential End Use Survey (REUS) data shows that 38 percent of FBC customers have electric heat, indicating a large potential market for the program. The program will continue with incentives for owners to upgrade electric heating systems to either central split (forced-air) or ductless mini-split (for customers with electric baseboard heating) air source heat pumps.

The incentive value for a forced air ASHP has been doubled in the 2017 DSM Plan and both configurations are eligible for the HERO bonus offer to attract more comprehensive retrofits.

As an alternative to direct financial incentives, FBC will also continue to offer heat pump loans for qualifying customers at a below market interest rate.

To ensure customers continue to attain high efficiencies from their heat pump technology, a heat pump tune-up rebate and promotion will be continued.

A1.3 *RESIDENTIAL LIGHTING*

Approximately 14 percent of all residential electrical use within the FBC service area is attributed to lighting. To help build market transformation and improve customer participation in lighting incentive programs, FBC will continue its collaboration with BC Hydro and retailers to provide "instant rebates" at the point of purchase for limited time periods over the course of the year. Rebates will be provided for qualified ENERGY STAR LED[2] lamps, controls and hard-wired luminaires.

A1.4 *NEW HOME*

FBC will provide incentives to encourage a higher level of whole home energy efficiency via a performance path, i.e. ENERGY STAR for New Homes (ESNH), to exceed the baseline

[2] Light emitting diode (LED)

requirements of the BC building code. ENERGY STAR rated appliances and lighting products are integral requirements to qualifying for ESNH designation.

To enable ESNH, FBC offers incentives for pre-construction plan review, and mid-construction blower door testing to ensure enrolled homes meet qualifying criteria.

A1.5 *WATER HEATING*

Approximately 50 percent of FBC customers' water heaters are heated with electricity. To encourage efficient water heating, FBC will continue to offer rebates for the installation of heat pump water heaters (HPWH) for customers with electrically heated hot water.

To improve product availability, FBC will continue discussions with manufacturers and retailers to increase availability and awareness for customers. A pilot project, in collaboration with BC Hydro and NRCan, is testing the suitability of ducted integrated HPWH and non-integrated HPWH (condenser and compressor are located outside the homes) in the BC climate.

Low flow showerheads will be distributed via Energy Saving Kits and other channels.

A1.6 *APPLIANCES*

FBC will continue to provide rebate offers for top tier ENERGY STAR clothes washers and dryers and refrigerators in collaboration with BC Hydro, appliance manufacturers and retailers.

A1.7 *LOW-INCOME HOUSEHOLDS PROGRAM*

FBC will continue to provide low income households with Energy Saving Kits (ESKs) and distribute them directly to qualified customers, primarily through low-income service providers, like food banks and low-income housing groups, and via direct mail.

The Energy Conservation Assistance Program (ECAP) is modelled on the previous BC Hydro/FEI program. The FBC ECAP program, which is offered in partnership with FEI, provides a Basic level of service to all qualifying participants. The base service includes direct installation of basic measures (ENERGY STAR lighting and low-flow products, i.e. showerheads), limited draft-proofing installation, occupant energy coaching, and an energy assessment. The assessment will identify those homes qualified for extended energy conservation measures like insulation of ceilings and basements, additional draft-proofing and/or ENERGY STAR refrigerators, for qualified single- and multi-family dwellings.

The ECAP for First Nation housing will include the direct installation of 30 heat pumps for the most vulnerable households.

A "top-up" rebate program for multi-unit residential buildings (MURBs) will be continued for common area lighting, HVAC and basic building envelope improvements.

A1.8 *RENTAL ACCOMMODATION*

In collaboration with FEI, the Rental Apartment Program (RAP) will continue to be offered. This program includes the direct installation of ESK-type in-suite measures for rental multi-unit residential buildings' (MURBs) suites. The program also provides no cost whole-building energy audits to identify additional measures (common area lighting, central space heating and hot water boilers) that could be undertaken by the building owners and provides two years of technical support and access to the FBC Commercial rebate programs (as discussed in further detail in section A2 below).

A1.9 *RESIDENTIAL BEHAVIOURAL*

FBC's messages to residential customers to encourage those customers to adopt energy-efficient behaviours (for example, the use of clotheslines) will continue using a variety of communication channels, including the distribution of product samples at community events.

An in-home display (IHD) incentive will enable participants to view real-time energy usage of their residential and small commercial (single phase) AMI meters. Either stand-alone devices, or a gateway modem – to enable smart phone apps- will allow customers to better manage their energy usage.

In collaboration with FEI, FBC plans to select a service provider to implement a customer engagement program (CEP). CEP will promote energy literacy and residential conservation and efficiency improvements through behaviour modifications. Customers will be able to set savings goals, create a personalized savings plan, track their progress, and receive tailored conservation and efficiency messaging and rebate offers. CEP and behaviour programs improve customer service and satisfaction, and enable energy savings.

A2 COMMERCIAL SECTOR PROGRAMS

Program offers for the Commercial sector, including the Irrigation class customers, will be focused on the economic opportunities in Lighting and Building Process Improvements (non-lighting processes such as Heating, Ventilation, Air Conditioning (HVAC), pumps & fans etc.

Customers are reached through a number of program offers: Custom Business Efficiency (CBEP), Commercial Product Rebates (CPR) and Business Direct Install (BDI) program.

The following table outlines the list of Commercial measure types, plan costs and savings, and the Benefit/Cost ratio on a Total Resource Cost basis. A description of each program and the primary delivery mechanisms follows.

Table A2-1: Commercial Program Expenditures & Savings

Program Area		2016 Approved		2017 Plan		
		Savings MWh	Cost ($000s)	Savings MWh	Cost ($000s)	TRC B/C ratio
1	Com Lighting	7,616	1,519	10,592	2,322	2.2
2	Building Improvement	4,589	976	2,931	784	2.3
3	Irrigation	490	69	144	25	3.6
4	**Total**	**12,695**	**2,564**	**13,666**	**3,131**	**2.2**

A2.1 *COMMERCIAL LIGHTING PROGRAM – NEW AND RETROFIT*

Program assistance and financial incentives to install high efficiency lighting will continue to be offered for existing and new commercial customers. Multi-unit residential building programs are managed in the Commercial sector to reflect best practices[3]. Common area measure savings and costs are attributed to the Commercial sector (however the costs and savings from in-suite measures will continue to be attributed to the Residential sector, as noted in section A1.8 above). Program assistance will include a free walkthrough energy assessment of the customer's premises and a subsidized detailed assessment, as requested.

New in 2016 was the introduction of the Business Direct Install (BDI) program. BDI utilizes a third-party implementer to engage contractors to perform lighting and other energy efficiency retrofits targeting small- and medium-sized enterprises, using proven energy assessment tools and energy efficiency sales training. The BDI offer will continue to be offered in 2017.

Lighting incentives for retrofit and new construction projects will be available through multiple channels including:

[3] Cracking the Multifamily Nut: Effective Strategies for Designing Multifamily DSM Programs. Esource Forum, Sept 2014.

- point-of-purchase retrofit product rebates at authorized lighting wholesalers;
- retrofit project rebates to qualified contractors through the BDI program;
- prescriptive retrofit rebates through the Demand-side Management Central (DSMC) online portal; and
- custom rebates for larger, more complex, new construction or retrofits through the Custom Business Efficiency offer.

A2.2 *BUILDING IMPROVEMENT – NEW AND RETROFIT*

Program assistance and financial incentives will continue to be offered for existing and new commercial customers, including MURB owners/operators, to install in-suite energy efficiency measures. Program assistance will include a free walkthrough energy assessment of the customers' whole building premises. FBC will also subsidize the cost of a more detailed assessment, as requested.

FBC will offer rebates to support energy efficiency for various end-uses, including, but not limited to: heating, ventilation, air conditioning measures, pumps, motors, commercial kitchen equipment, compressed air, and refrigeration technologies. Energy efficiency retrofit rebates will be available through multiple channels including:

- point-of-purchase retrofit product rebates at authorized distributors;
- point-of-purchase retrofit rebates from qualified contractors through the BDI program;
- prescriptive retrofit rebates through the DSMC online portal; and
- custom rebates for larger, more complex retrofits through the Custom Business Efficiency offer.

FBC will also offer new construction rebates to encourage efficient construction practices for new commercial and multi-unit residential buildings. Incentives will be offered to offset the incremental cost of energy efficiency construction compared to standard "baseline" construction. The baseline for new construction rebates will continue to be ASHRAE 90.1[4], as adopted by the provincial building code.

A2.3 *PARTNERS IN EFFICIENCY*

FBC will continue to offer a "Partners in Efficiency" initiative for local governments and key account customers. In addition to the incentives offered in the form of rebates and energy

[4] American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE). Standard 90.1 has been a benchmark for commercial building energy codes in the USA and around the world, including the BC Part 3 Building Code.

assessments, FBC representatives work closely with qualifying customers to help determine the economics for energy efficiency upgrades to new and existing facilities and street lighting.

FBC will also co-sponsor in-house energy specialists for the City of Kelowna and the University of British Columbia Okanagan to help build institutional capacity to complete energy efficiency retrofit projects within their organizations.

A2.4 *IRRIGATION*

Program assistance and financial incentives will continue to be offered for irrigation customers to install energy efficiency measures to promote energy efficient irrigation. Free walk-through energy assessment will be available to irrigation customers.

Product rebate incentives on energy-efficient irrigation system components (variable-speed drives, high-efficiency pumps and low pressure irrigation systems etc.) will be offered through the DSMC online rebate portal. A custom option approach will also be offered for comprehensive system retrofits for qualified customers through the Custom Business Efficiency offer.

A3 INDUSTRIAL SECTOR PROGRAMS

The following tables outline the proposed Industrial program, plan costs and savings, and the Benefit/Cost ratio on a Total Resource Cost basis. A description of the Industrial Efficiency program and the primary delivery mechanisms follows.

Table A3-1: Industrial Efficiency Expenditures & Savings

Program Area		2016 Approved		2017 Plan		
		Savings MWh	Cost ($000s)	Savings MWh	Cost ($000s)	TRC B/C ratio
1	Industrial	1,585	209	1,556	309	1.9
2	**Total**	**1,585**	**209**	**1,556**	**309**	**1.9**

A3.1 *INDUSTRIAL EFFICIENCY*

FBC will continue to offer program assistance and financial incentives for industrial customers to achieve increased efficiency in their processes, buildings and/or systems. Program assistance will include a free walkthrough energy assessment of the customer's premises.

New in 2016 was the offer of subsidized facility-wide energy efficiency assessments and detailed feasibility studies to qualifying industrial customers. The Industrial budget increase is partly to fund such energy efficiency assessments in 2017. Also the Industrial incentive rate has been increased to a nominal $0.15 per kWh saved for qualifying projects.

FBC will offer custom rebates through the Custom Business Efficiency program offer to support energy efficiency for various industrial end-uses, including, but not limited to: industrial process optimization, lighting, heating, ventilation and air conditioning, pumps, fans, compressed air, hydraulics and other motor systems. Prescriptive product rebates (for example, variable-speed air compressors) will also be offered through the DSMC online rebate portal.

A4 SUPPORTING INITIATIVES

Supporting initiatives are important for the success of the DSM Plan because they provide program support, educate (customers and students), build trade ally capacity and promote market transformations, which are necessary to enable the potential savings that have been identified. The supporting initiatives, which complement the incentive-based programs listed previously, are characterized as portfolio level spending as they do not result in direct DSM savings.

Table A4-1 lists the components and Approved/Plan expenditures for 2016-17 with a consistent level of effort anticipated. Staff labour was embedded in the component budgets in 2016, but is shown as a separate line item in 2017.

Table A4-1: Supporting Initiative Expenditures

	Program	2016 Approved Cost	2017 Plan Cost
1	Public Awareness	250	200
2	Community Energy Planning	100	75
3	Trades Training	100	100
4	Education (schools)	200	150
5	Codes and Standards	25	25
6	Labour		124
7	**Total**	**675**	**674**

A4.1 *PUBLIC AWARENESS*

This component seeks to increase public awareness of energy efficiency and conservation matters and programs, and educates customers in regards to the availability of DSM programs. To promote the Company's incentive programs, collateral such as brochures, posters, point-of-sale materials, business case reports and promotional items are utilized. Collateral and promotional items will be distributed to residential customers at trade shows and community events. It will also be provided to trade allies (electrical contractors, appliance retailers, heat pump contractors) for distribution to customers. The point-of-sale materials highlighting energy efficiency and conservation will be provided to wholesale and retail partners that sell energy efficiency equipment.

Targeted information campaigns with specific messaging about programs and energy efficiency may be purchased for trade magazines, newsletters and other industry focused information pieces. Mass market advertising (on-line, radio and print) will also be used to promote general conservation messaging and residential rebate programming.

A4.2 COMMUNITY ENERGY PLANNING

This element of Supporting Initiatives provides financial assistance to local governments and institutional customers to facilitate energy efficiency planning activities like the development of community energy efficient strategic plans, energy efficient design practices and organizational policies like adopting advanced energy efficiency standards for the entities' own building stock. The planning must be aimed at specifically reducing electricity usage and demand.

A4.3 TRADES TRAINING

FBC provides sponsorships for training and support for a number of initiatives from the building trades and electrical non-profit trade organizations,[5] as well as support for energy management planning training like Natural Resources Canada's "Spot the Savings" workshops. Committed to growing the energy efficiency knowledge amongst the trades, FBC will continue to provide support for these programs in 2017.

A4.4 EDUCATION PROGRAMS

FBC, in collaboration with FEI, is developing an online education program that supports the development of energy education in BC classrooms. It will provide high quality, engaging, curriculum-connected resources and programs that highlight the BC energy story and encourages a bias-balanced development of energy literacy in classrooms for kindergarten to grade 9 students. The education program will be piloted in 60+ schools in school year 2016-17 and launched province-wide in September 2017. (Program design for grades 10-12 will begin in 2017 and be piloted in school year 2017-18.)

In addition, FBC will provide funding support for several external third party non-profit educational organizations, such as BC Lions Energy Champions, Green Bricks and Destination Conservation to deliver conservation messaging.

FBC also provides financial and in-kind support for post-secondary initiatives for curriculum-based class-room instruction and broader campus-wide behaviour change programs.

A4.5 CODES AND STANDARDS

A number of international and national organizations such as the Consortium for Energy Efficiency, the Canadian Standards Association, and Natural Resources Canada work to set new efficiency standards for consumer electronics, appliances, and lighting products amongst other equipment and technologies. Similarly local, provincial and federal governments are setting policy and regulations to increase as-built energy efficiency performance or raise

[5] TECA (Thermal Environmental Comfort Association), SICA (Southern Interior Construction Association), CHBC (Canadian Home builders Association), BCEA (BC Electrical Association), etc.

awareness (e.g. EnerGuide building ratings). FBC supports codes and standards policy development and research, through in-kind and financial co-funding arrangements.

A5 PLANNING AND EVALUATION

Planning and evaluation of the DSM initiatives are required to properly plan and control the proposed DSM expenditures and ensure the energy savings targets are met. This expenditure includes provisions for planning and evaluation staff, who perform project due diligence including savings verification.

Updating the FBC DSM Plan at regular intervals ensures that new and emerging commercially available DSM measures are taken into account, avoided cost assumptions are updated and the appropriate program course corrections are made.

The following table shows the major planning and evaluation cost elements and the plan cost for 2017 with 2016 approved for comparison. The increase in the 2017 staffing costs now includes an allowance for the Director of C&EM who is allocated between FBC and FEI.

Table A5-1: Planning and Evaluation Expenditures

	Component	2016 Approved	2017 Plan
1	Staffing, incl training costs	395	440
2	Office Expenses	50	55
3	Consulting Fees	90	96
4	M&E Reports	200	186
5	**TOTAL**	**735**	**777**

A5.1 *MONITORING AND EVALUATION*

Monitoring & Evaluation (M&E) is necessary to ensure that the DSM program expenditures will yield the target energy savings expected and that the programs are operating effectively.

Monitoring and evaluation of energy efficiency programs provides internal and external accountability by reducing uncertainty in the estimates of energy and demand savings, and by determining the cost effectiveness of these programs using the governing TRC benefit/cost test after adjusting for free-rider and spill-over effects.

Table A5-2 provides a listing of the 2017 Plan M&E study types and proposed expenditures, including staff labour. The proposed budget ($375,000) aligns with the Company's EM&V Framework and industry general practice[6] for budget spending on M&E activities, representing 4.9 per cent of the Company's total 2017 DSM portfolio expenditure.

[6] California Evaluation Framework. June 2004. TecMarket Works.

Table A5-2: 2017 Monitoring & Evaluation Plan Expenditures

	2017	
Sector/Program	**Study Type**	**Plan ($000s)**
Residential		
EnergyStar for New Homes	Process	8
Low Income ECAP	Impact	4
Behavioral	Baseline study	10
Rental	Survey	2
Commercial/Industrial		
Commercial Lighting	Comprehensive	60
New Construction Commercial and Industrial	Process, Impact & Case Study	50
Business Direct install	Process & Impact	35
MURB	Process	10
Allowance for unplanned EM&V		7
Sub-Total		**186**
EM&V Staffing		189
Total		**375**

A6 INTEGRATION WITH FEI'S CONSERVATION AND ENERGY MANAGEMENT (C&EM) PROGRAM

The C&EM[7] department is well on the way towards full integration of the design, marketing and processing of FBC and FEI program offers for customer-facing components of program offers, especially in the shared service territory.[8] The intent is to provide customers with "one-stop" information and program access via the website, other marketing collateral and face-to-face interactions.

Additionally, FBC will continue to collaborate with BC Hydro, the BC Ministry of Energy and Mines and NRCan whenever appropriate to design and promote programs that support market transformation.

[7] C&EM was formerly known as PowerSense, in the FBC service area, and Energy Efficiency and Conservation (EEC) in the FEI service area.

[8] The shared service territory is where the service territory of FortisBC Energy Inc. and the service territory of FortisBC Inc. overlap.

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Table A6-1: Summary Table of 2017 DSM Plan

Program/ Portfolio areas	Savings (MWh)	Cost ($000s)	Benefit/Cost Tests				Levelised Cost ($/MWh)
			TRC	UCT	PCT	RIM	
Residential							
Home Improvement	364	348	1.7	2.6	7.3	0.8	44.5
Heat Pumps	781	298	1.5	2.6	4.6	0.8	53.1
New Home	126	151	1.4	3.3	2.8	0.8	42.1
Lighting	2,735	190	2.2	21.3	2.8	0.9	5.6
Appliances	126	133	1.3	1.6	9.2	0.6	74.8
Water Heating	17	30	1.5	1.1	0.0	0.5	110.3
Low Income & Rentals	3,247	1,367	3.4	3.3	0	0.7	54.5
Behavioural	3,097	200	3.7	3.7	0	0.7	29.9
Subtotal	**10,493**	**2,718**	**2.5**	**4.4**	**6.6**	**0.8**	**32.3**
Commercial							
Com Lighting	10,592	2,322	2.2	3.6	4.9	1.0	37.9
Building Improvement	2,931	784	2.3	6.4	2.9	1.1	20.8
Irrigation	144	25	3.6	3.1	0	0.9	36.3
Subtotal	**13,666**	**3,131**	**2.2**	**4.0**	**4.3**	**1.1**	**34.1**
Industrial							
Industrial	1,556	309	1.9	5.1	2.6	1.1	22.0
Subtotal	**1,556**	**309**	**1.9**	**5.1**	**2.6**	**1.1**	**22.0**
Program Total	**25,715**	**6,158**	**2.3**	**4.2**	**5.1**	**0.9**	**32.6**
Portfolio							
Supporting Initiatives		674					
Planning & Evaluation		777					
Total (including Portfolio area)		**7,610**	**2.0**	**3.1**	**3.6**	**0.8**	**43.8**

2

Appendix B

2015 YEAR-END DSM REPORT

Diane Roy
Director, Regulatory Services

Gas Regulatory Affairs Correspondence
Email: gas.regulatory.affairs@fortisbc.com

Electric Regulatory Affairs Correspondence
Email: electricity.regulatory.affairs@fortisbc.com

FortisBC
16705 Fraser Highway
Surrey, B.C. V4N 0E8
Tel: (604) 576-7349
Cell: (604) 908-2790
Fax: (604) 576-7074
Email: diane.roy@fortisbc.com
www.fortisbc.com

March 31, 2016

British Columbia Utilities Commission
6th Floor, 900 Howe Street
Vancouver, BC
V6Z 2N3

Attention: Ms. Laurel Ross, Acting Commission Secretary and Director

Dear Ms. Ross:

Re: FortisBC Inc. (FBC)
Electricity Demand-Side Management (DSM) 2015 Annual Report

Attached please find the Electricity DSM Program 2015 Annual Report for FBC.

If further information is required, please contact Sarah Wagner, Senior Regulatory Analyst, at (250) 469-6081.

Sincerely,

FORTISBC INC.

Original signed:

Diane Roy

Attachments

FortisBC Inc.

Electricity
Demand-Side Management Programs
2015 Annual Report

March 31, 2016

Table of Contents

List of Appendices

Index of Tables and Figures

1. REPORT OVERVIEW

This Demand-Side Management (DSM) Annual Report (the Report) provides highlights of FortisBC Inc.'s (FBC or the Company) DSM programs for the year ended December 31, 2015. The Report reviews the progress of FBC's DSM programs in meeting the approved 2015 DSM Plan by educating and incenting FBC's customers to conserve energy and improve the energy efficiency of their homes, buildings and businesses.

2015 was the first full year of integration for the FBC's DSM and FortisBC Energy Inc.'s (FEI) Energy Efficiency and Conservation (EEC) divisions, with a joint leadership team that combined program managers' responsibilities, wherever possible. The integration prompted FBC's PowerSense sub-brand to be retired. The Conservation and Energy Management (C&EM) department name was adopted for both electricity and natural gas divisions.

Summaries of how FBC met the DSM Regulation requirements in 2015 and FBC's response to Directives from Order G-186-14 approving FBC's 2015-2016 DSM Expenditure Plan are included in Section 1-3 and Section 1-4 respectively. Section 2 through Section 7 of the Report provide an overview of DSM program activities in 2015, along with a comparison of actual energy savings and costs to Plan and a statement of financial results (Table 1-1), including Total Resource Cost (TRC) cost-effectiveness test results for 2015. Consistent with previous years' Reports, additional test results and historical DSM costs and energy savings are included in Appendix A and Appendix B, respectively.

1.1 *PORTFOLIO LEVEL TOTAL RESOURCE COST (TRC) RESULTS*

Table 1-1 provides an overview of FBC's 2015 energy savings, expenditures and TRC cost-effectiveness test results for all DSM programs, by program, sector and at the portfolio level. The Company achieved an overall portfolio TRC of 2.0 on DSM expenditures of $3.5 million and electricity savings totalling 12.6 GWh. The Company's spending levels were less than the approved levels for the reasons set out in Section 1.2 below. In accordance with British Columbia's Demand-Side Measures Regulation, additional detail, including results for the following cost effectiveness test calculations, are provided for the overall portfolio and each Program Area in Appendix A, Table A-1: TRC, Utility Cost Test (UCT), and the Ratepayer Impact Measure (RIM).

Table 1-1: FortisBC Inc. DSM Portfolio Results for 2015

Program Area	2015 Approved Plan Savings (MWh)	2015 Actual Energy Savings (MWh)	Lifetime savings (MWh)[1]	Incentive Expenditure ($000)	Non-Incentive Expenditure ($000)	2015 Actual Spend ($000s)	2015 Approved Plan ($000s)	TRC
Residential								
Home Improvement	3,106	231.2	6,326	62.0	136.8	198.7	884	1.7
Behavioural	888	0.0				-	85	
Watersavers	850	4.6	64	0.3	1.8	2.2	387	1.5
Appliances	288	51.9	865	23.3	47.7	71.0	96	1.2
Lighting	1,569	4,144.4	50,893	167.9	30.1	198.0	193	5.3
Heat Pumps	1,618	569.0	17,561	138.4	44.1	182.5	302	1.5
New Home Program	1,179	356.2	12,366	37.6	73.2	110.8	390	1.1
Low Income Housing	2,598	281.8	1,827	97.5	189.9	287.3	824	1.3
Residential Total	**12,096**	**5,639.0**	**89,903**	**526.9**	**523.5**	**1,050.4**	**3,160**	**2.9**
Commercial								
Lighting	7,445	4,089.3	71,188	404.4	331.0	735.4	1,485	2.0
Building Improvement	3,454	1,605.9	41,841	175.8	367.3	543.0	842	1.6
Computers	378	0.0		-	-	-	55	
Municipal (WWTP)	759	186.6	4,900	24.5	11.7	36.2	79	2.3
Irrigation	490	0.0		-	9.0	9.0	69	
Commercial Total	**12,526**	**5,881.8**	**117,929**	**604.7**	**719.0**	**1,323.7**	**2,530**	**1.8**
Industrial								
Industrial Efficiency	1,537	1,086.8	27,937	146.2	79.8	226.0	202	2.0
Industrial Total	**1,537**	**1,086.8**	**27,937**	**146.2**	**79.8**	**226.0**	**202**	**2.0**
Total Programs	**26,159**	**12,607.6**	**235,769**	**1,277.8**	**1,322.3**	**2,600.1**	**5,892**	**2.2**
Portfolio Level Activities								
Planning & Evaluation	-	-		-	584.9	584.9	725	
Supporting Initiatives	-	-		-	346.3	346.3	675	
Total Portfolio	**26,159**	**12,608**	**235,769**	**1,277.8**	**2,253.5**	**3,531.3**	**7,292**	**2.0**

[1] Lifetime savings are energy savings over the lifetime of the measure

In 2015, FBC met the conditions of the Province's *Demand-Side Measures Regulation*, achieving a portfolio TRC value of 2.0. There were no measures or programs with a TRC less than 1.0, therefore use of the modified TRC[1] (MTRC) was not required. The Low Income program achieved a TRC of 1.3, after including the allowed 40 percent adder to benefits.

The TRC test results are higher than in 2014 (1.6) as a result of using the approved long run marginal cost (LRMC) of BC clean or renewable electricity, of $111.96 per MWh[2], as compared to the long run avoided power purchase cost of $84.94 per MWh used in 2014.

1.2 *MEETING APPROVED SPENDING LEVELS*

The Company's DSM expenditures were below the levels approved in the 2015-2016 DSM Plan. The Company's spending was 48% of the approved levels and savings were 48% of the corresponding target.

[1] FBC employs a 15% non-energy benefit (NEB) for its MTRC adder (per 2014 DSM Regulation 326/2008).
[2] BCUC Order G-186-14

The Company has a long record of successfully meeting or exceeding its savings targets, while keeping expenditures within approved plans and 2015 results were not in line with past performance. A number of factors contributed to the 2015 outcome:

- The Commission's Decision and Order G-186-14, approving FBC's Application for Approval of DSM Expenditures for 2015 and 2016 (2015-16 DSM Plan), that restored 2015 DSM expenditures to the much higher 2012-2013 DSM spending levels, was received on December 3, 2014. The timing of the Decision impacted the 2015 DSM expenditure year due to:
  - the lead time required to hire and train additional qualified staff necessary to develop and manage DSM programs;
  - the lead time to reintroduce or to develop and launch new programs;
  - the time required to follow the comprehensive procurement processes for developing and implementing new programs (e.g., the RFP for the new Business Direct Install program that is configured considerably differently than the previous direct install offer); and
  - the time required to rebuild customer and trade ally awareness that DSM programs, discontinued in 2014, were reintroduced and available to them.
- Collaboration with other public utilities resulted in harmonized rebates at lower levels than those offered on a stand-alone basis in the past, which resulted in diminished returns on certain maturing programs (e.g., top tier Energy Star appliances); and
- The withdrawl of partners in the LiveSmartBC and ecoEnergy programs left the Company offering stand-alone programs with lower customer rebates, the consequence of which was reduced participation in the Home Improvement program.

Given that 2015 was a transition year from 2014's scaled-back programs and considerable development work was undertaken for new and relaunched programs, the Company believes it now has the necessary resources and a fulsome complement of programs in place going forward to achieve budget and target performance in 2016.

1.3 *MEETING ADEQUACY REQUIREMENTS OF THE DEMAND-SIDE MEASURES REGULATION*

The *Demand-Side Measures Regulation* has the following requirements for a utility's portfolio of DSM activity to be considered adequate:

> A public utility's plan portfolio is adequate for the purposes of Section 44.1 (8) c of the Act only if the plan portfolio includes all the following:
>
> a) A demand-side measure intended specifically to assist residents of low-income households to reduce their energy consumption;

b) If the plan portfolio is introduced on or after June 1, 2009, a demand-side measure intended specifically to improve the energy efficiency of rental accommodations;
c) An education program for students enrolled in schools in the public utility's service area;
d) If the plan portfolio is submitted on or after June 1, 2009, an education program for students enrolled in post-secondary institutions in the public utility's service area.

The Company met all the requirements for adequacy. The programs for low income customers are discussed in Section 3, including Energy Savings Kits (ESK) and Energy Conservation Assistance Program (ECAP). With regard to offerings to rental apartment buildings, a number of the Commercial Energy Efficiency programs are intended for use by owners of rental buildings, including Rental Apartment Efficiency Program (RAP), (see Section 4.2.1). ECAP and ESK programs, as well as all Residential Energy Efficiency programs, are also available to qualifying rental properties.

In terms of education programs, the Company funded a variety of initiatives for K-12 students, including Destination Conservation, BC Lions Energy Champion School Assembly Presentations, Energy is Awesome and Green Bricks. The Company also funded post-secondary student engagement initiatives, including a program at Selkirk College and providing training grants (see Section 6.2.2).

1.4 *ADDRESSING BCUC DIRECTIVES FROM ORDER G-186-14*

The British Columbia Utilities Commission (BCUC or the Commission) approved FBC's 2015-2016 DSM Expenditures on December 3, 2014 (Order G-186-14) and the three Directives related to the 2015 Annual Report and FBC's responses to them are summarized in Table 1-2 below, (note that Directives 7, 15 and 17 issued in Order G-186-14 were previously addressed in Table 1.1 of the 2014 Annual Report):

Table 1-2: Responses to BCUC Directives (Order G-186-14)

Directive Reference	BCUC Directive	FBC Response
Directive 13	Commission Panel directs FBC to include in its next DSM Annual Report a review and discussion of whether opportunities exist in expanding DSM funding to 2013 actual levels for residential heat pumps, lighting and new home programs while continuing to obtain cost-effective energy savings.	The BC Conservation Potential Review (BC CPR) study that is underway, will reassess the economics and market opportunity (economic potential) for all DSM measures. The BC CPR findings for the listed measures will form the major input to the next long-term DSM Plan, which in turn will inform the DSM expenditure filings and hence targets for future years.
Directive 14	Commission Panel directs FBC to include in its next DSM Annual Report a review and discussion of whether opportunities exist in expanding DSM funding to 2013 approved levels for municipal water while continuing to obtain cost-effective energy savings.	Municipal infrastructure, including water/wastewater measures, are included in the BC CPR study scope to assess the cost-effective potential. In the interim, such projects are vetted through the Custom Business Efficiency Program (see Section 4.2.2 of this report).
Directive 21	FBC is directed to file, confidentially if appropriate, the full versions of EM&V reports with its DSM Annual Report.	FBC is compliant with this directive in the current DSM Annual Report and will follow it in subsequent DSM Annual Reports. The Executive Summary of the Home Improvement Program EM&V report is filed as Appendix C and the full report has been filed confidentially.

1.5 *COLLABORATION & INTEGRATION*

The Company continues to collaborate and integrate energy efficiency programming with both FortisBC Energy Inc. (FEI) and British Columbia Hydro and Power Authority (BC Hydro), as well as with other entities such as governments and industry associations.

2015 was the first full year of integration for the FBC's DSM and FEI's EEC divisions, with a joint leadership team that combined program managers' responsibilities, wherever possible. The integration prompted FBC's PowerSense sub-brand to be retired. The Conservation and Energy Management (C&EM) department name was adopted for both electricity and natural gas divisions.

The Company recognizes that collaboration among utilities will maximize program efficiency and effectiveness. Collaborative activity is reported in the individual Program Area sections and program descriptions.

FBC, FEI and BC Hydro also continue to experience additional benefits from their collaboration efforts, including cost savings, streamlined application processes for customers, extended program reach and consistent and unified messaging, resulting in improved energy literacy.

1.6 *PORTFOLIO SUMMARY*

The Company's DSM portfolio met the goal of cost effectiveness, with a TRC value of 2.0 in 2015 and FBC is of the view that both energy savings accounted for in the portfolio and the resulting TRC are conservative. Benefits from additional activities, such as Supporting

Initiatives, play an important role in supporting the development and delivery of programs, while helping create a culture of conservation in British Columbia.

Although spending and savings levels were about half of the approved Plan, they approximate 2014 results. Considerable program development work was undertaken in 2015, which positions the Company for meeting its approved targets in 2016.

2. RESIDENTIAL PROGRAM AREA

2.1 OVERVIEW

The Residential Program Area was successful in reducing annual electricity consumption by 5.6 GWh and achieving an overall TRC of 2.9. Over $1.05 million was invested in Residential energy efficiency upgrades in 2015, and 50 percent of this expenditure was incentives. The energy savings results from Residential programs were 47 percent of Plan with Lighting contributing 73 percent of total residential savings.

Residential programs address customers' major end-uses in residential single-family homes, row houses, townhomes or mobile homes, and include retrofit and new home applications. Residential programs, in combination with the Companies' education and outreach activities, play an important role in driving the culture of conservation in British Columbia.

Table 2-1 summarizes the actual expenditures for the Residential Program Area in 2015 compared to the Plan, including incentive and non-incentive spending, annual and lifetime electric savings, as well as TRC cost-effectiveness test results.

Table 2-1: 2015 Residential Program Area Results Summary

Program Area	2015 Approved Plan Savings (MWh)	2015 Actual Energy Savings (MWh)	Lifetime savings (MWh)	Incentive Expenditure ($000)	Non-Incentive Expenditure ($000)	2015 Actual Spend ($000s)	2015 Approved Plan ($000s)	TRC
Residential								
Home Improvement	3,106	231.2	6,326	62.0	136.8	198.7	884	1.7
Behavioural	888	0.0				-	85	
Watersavers	850	4.6	64	0.3	1.8	2.2	387	1.5
Appliances	288	51.9	865	23.3	47.7	71.0	96	1.2
Lighting	1,569	4,144.4	50,893	167.9	30.1	198.0	193	5.3
Heat Pumps	1,618	569.0	17,561	138.4	44.1	182.5	302	1.5
New Home Program	1,179	356.2	12,366	37.6	73.2	110.8	390	1.1
Low Income Housing	2,598	281.8	1,827	97.5	189.9	287.3	824	1.3
Residential Total	**12,096**	**5,639.0**	**89,903**	**526.9**	**523.5**	**1,050.4**	**3,160**	**2.9**

2.2 RESIDENTIAL PROGRAMS

The highlights of the Residential programs are outlined below:

2.2.1 Home Improvement Program and Heat Pump Program

The following activities were undertaken in the Home Improvement and Heat Pumps programs in 2015:

- The Home Energy Rebate Offer (HERO), a province wide program delivered and marketed in collaboration with BC Hydro and FEI, and the main contributor to the Heat Pump and Home Improvement programs' results, continued to gain momentum. By focusing on the most cost-effective retrofit measures and using a "menu" approach, the

program provides incentives to customers for insulation and draft-proofing, ventilation, and space and water heating. A technical review of the program took place in late 2015 as part of the DSM Monitoring and Evaluation activities discussed in Section 7 of the report and its recommendations will inform 2016 program implementation. The executive summary of the Home Improvement program M&E report is provided in Appendix C;

- A pilot retail point of sale program was implemented in partnership with FEI and BC Hydro with RONA, Canadian Tire and Home Depot. Instant rebates were offered on draft-proofing products, thermostats and low-flow showerheads;
- In partnership with FEI, BC Hydro and the British Columbia Ministry of Energy and Mines (MEM), funding was provided to support a Home Performance Stakeholder Council; and
- Heat pump rebates were offered through two channels: ductless heat pumps were offered through the HERO program and central heat pump systems were accessed through a stand-alone program. The Company's long-standing air source heat pump loan offer continued for electrically-heated homes.

As noted previously, the executive summary of the completed M&E report for the Home Improvement program is provided in Appendix C. The full evaluation report is filed separately in Confidential Appendix D and FBC requests that the Commission hold these reports in confidence. These reports contain customer-specific information that should not be disclosed to the public. In addition, the methodology and processes used in the reports are proprietary to the consultants hired by FBC.

2.2.2 Appliance Program

The Appliance Retail Program was re-launched in 2015 with higher efficiency standards (top tier) for clothes washer and refrigerators. The program introduced the ENERGY STAR clothes dryers incentive, which had a higher than expected response rate.

2.2.3 Residential Lighting Program

The Residential Lighting program offered point-of-sale rebates for ENERGY STAR certified lighting products. Offered in collaboration with BC Hydro to provide a BC wide offer to customers and lighting retailers across the BC market, the program ran for two two-month periods in major retail stores. The Residential Lighting program exceeded Plan savings by 264 percent due to successful retail campaigns, while costs were 103 percent of Plan.

2.2.4 New Home Program

In response to building code updates, the New Home program was re-designed and launched in late 2015. It offers incentives for homes built to the ENERGY STAR New Home standard. Approximately half of the 2015 New Home rebate expenditures were a wrap-up of 2014 projects.

2.2.5 Low Income Program

This program is discussed in Section 3 of the Report.

2.2.6 Behavioural Program

The Plan included provisions for a Customer Engagement Tool (CET) and for In-Home Display (IHD) pilots, neither of which proceeded in 2015. The CET relies heavily on social norms by comparing a customer's energy usage to the average of their neighbours' in order to prompt behavioural change (i.e. energy savings). The CET pilot was postponed to ensure that customer data exchanged with the service provider is secure and in compliance with the *Personal Information Protection Act* (PIPA) and corporate privacy policies. In the case of IHDs, the AMI meter data management system is not yet configured for the necessary two-way communication necessary to enable IHDs to display the customers' rate, billing dates and other pertinent information. Hence, there were no expenditures nor savings attained in 2015 in the Behavioural program.

2.2.7 Residential Summary

In 2015, the Lighting program remained the core Residential measure. It delivered 73% of Residential MWh savings and it was the most cost-effective program in the portfolio.

In 2016, FBC will focus on increasing customer participation in its DSM programs by further engaging with retailers, contractors and manufacturers to bring broader awareness of the programs. In particular, a part-time position is being assigned to engage retailers to increase customer participation in the Lighting and Appliance programs, by providing in-store training on the programs. The Home Energy Rebate Offer is going through a program refresh to increase incentives provided to customers. A pilot program is in the planning stages that could provide participating customers with a home performance plan for energy efficient home renovation projects.

3. LOW INCOME PROGRAM AREA

3.1 OVERVIEW

In 2015, the Company saw continued success with the Energy Savings Kit (ESK) program. It worked collaboratively with FEI to develop and launch the Energy Conservation Assistance Program (ECAP) within its service territory. FBC also secured $225,000 in funding from MEM to deliver a direct installation program for heating system upgrades (air source heat pumps) for eligible First Nations housing stock.

Table 3-1 summarizes the planned and actual expenditures for the Low Income Program Area. In accordance with July 2014 amendments to Section 4(2)(b) of the Demand-Side Measures Regulation, the TRC of 1.3 for low income programs includes a 40 percent adder in the benefits, which increases the deemed cost effectiveness.

Table 3-1: 2015 Low Income Program Results Summary

Program Area	2015 Approved Plan Savings (MWh)	2015 Actual Energy Savings (MWh)	Lifetime savings (MWh)	Incentive Expenditure ($000)	Non-Incentive Expenditure ($000)	2015 Actual Spend ($000s)	2015 Approved Plan ($000s)	TRC
Low Income Housing	2,598	281.8	1,827	97.5	189.9	287.3	824	1.3
Low Income Total	**2,598**	**281.8**	**1,827**	**97.5**	**189.9**	**287.3**	**824**	**1.3**

Savings were 281.8 MWh for the Low Income programs. No savings were attributed to the Basic ECAP, as the program was launched in November and only energy evaluations were completed by the end of the year. ECAP energy efficient measure installations and savings will be accounted for in 2016.

A total of 764 ESKs were distributed in 2015, contributing savings of 201.1 MWh. There were also First Nations ECAP measures installed in 2015 that were carried over from 2014 First Nations energy assessments, for which 80.8 MWh for 15 heat pumps were recorded. Incentives recorded for all First Nations ECAP projects were $63,137, after recovery of 50 percent of costs from the MEM grant.

3.2 LOW INCOME PROGRAMS

The following outlines the three Low Income programs delivered in 2015:

In partnership with FEI, ESKs were promoted and distributed at local food banks in the pre-heating season, as well as direct mailed to on-line applicants and Contact Centre referrals. The Company worked with FEI and BC Hydro on a direct mail brochure through the Ministry of Social Development's cheque run, which reached over 180,000 recipients in the province.

The First Nation ECAP direct-install program, offered with MEM co-funding, provides energy evaluations, energy conservation advice and the direct installation of air source heat pumps to electrically-heated homes on Reserves within the service territory. The program was piloted with

the Penticton Indian Band and will be expanded to other bands within the Company's service territory in 2016.

For eligible low-income single or multi-family dwellings, the Company designed and launched ECAP for the FortisBC shared service area[3], in collaboration with BC Hydro and in partnership with FEI. The ECAP program provides energy evaluations, advice, and the direct installation of energy efficiency measures like LED and CFL lighting, low-flow showerheads and faucet aerators at no cost to eligible households. Some single-family homes may also qualify for new Energy Star refrigerators, high-efficiency furnaces, and draft-proofing and insulation at the "advanced" program level. The program met its 2015 participation objectives within the first six weeks of launching.

[3] FortisBC's shared service area is essentially the Company's electric service area wherein both natural gas & electricity are supplied by FortisBC.

4. COMMERCIAL PROGRAM AREA

4.1 OVERVIEW

Commercial DSM programs encourage commercial customers to reduce overall consumption of electricity and associated energy costs. The Commercial programs produced aggregate electricity savings of 5.9 GWh and achieved an overall TRC of 1.8. $1.3 million was invested in Commercial programs, of which 46 percent was incentive spending.

Table 4-1 summarizes the plan and actual expenditures for the Commercial programs, including incentive and non-incentive spending, annual and lifetime savings, as well as the TRC cost-effectiveness test results.

Table 4-1: 2015 Commercial Program Results Summary

Program Area	2015 Approved Plan Savings (MWh)	2015 Actual Energy Savings (MWh)	Lifetime savings (MWh)	Incentive Expenditure ($000)	Non-Incentive Expenditure ($000)	2015 Actual Spend ($000s)	2015 Approved Plan ($000s)	TRC
Commercial								
Lighting	7,445	4,089.3	71,188	404.4	331.0	735.4	1,485	2.0
Building Improvement	3,454	1,605.9	41,841	175.8	367.3	543.0	842	1.6
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Municipal (WWTP)	759	186.6	4,900	24.5	11.7	36.2	79	2.3
Irrigation	490	0.0		-	9.0	9.0	69	
Commercial Total	**12,526**	**5,881.8**	**117,929**	**604.7**	**719.0**	**1,323.7**	**2,530**	**1.8**

The Commercial sector recorded savings of 5.9 GWh, or 47 percent of the 2015 Plan. Almost 60 percent of these savings were realized through the commercial lighting programs, including point-of-sale product and custom lighting retrofit rebates. An example of a commercial lighting project was an LED parking lot lighting upgrade at a Kelowna car dealership, incented through the Commercial Product Rebate (CPR) program, which contributed 52 MWh of savings.

Building and Process Improvement (BIP) energy savings were 1.6 GWh or 46 percent of Plan. An example of a BIP project was a refrigeration upgrade at a grocery store in Penticton, incented through the Custom Business Efficiency Program, which contributed 350 MWh of savings. There were no irrigation projects completed in 2015.

Commercial sector costs in 2015 amounted to $1.32 million or 52 percent of Plan. The largest cost component of Commercial programs was the Lighting program, which includes incentives paid through the CPR program and custom lighting projects incented through the Custom Business Efficiency program (CBEP).

4.2 COMMERCIAL PROGRAMS

The following outlines the key Commercial DSM programs offered in 2015:

4.2.1 Product Rebate and Direct Installation Programs

- The CPR program offers prescribed rebates for commercial lighting, HVAC, refrigeration, commercial kitchen appliances and other electric energy efficiency measures. The program was offered through point-of-sale rebates at lighting wholesalers and directly to customers. In 2015, the number of point-of-sale distributors was increased significantly. New irrigation, LED signage and pool pump rebates were also added to the program. Recent updates to general service lighting regulations prompted the elimination of most T8 lighting incentives. A third party study was initiated to revisit and expand CPR offers for 2016;
- After consulting with customers and irrigation suppliers, new prescriptive and custom irrigation offers were developed to improve accessibility and uptake by irrigation customers. Irrigation rebates will be available starting in the first quarter of 2016;
- In partnership with FEI, FBC launched the Rental Apartment Efficiency Program (RAP) in September 2015. The program specifically addresses the rental market by providing direct in-suite installations of hot water and LED lighting measures, energy assessments and implementation support for deeper energy efficiency retrofits at the building-wide level; and
- To support customers in multi-unit residential buildings (MURBs), FBC developed the MURB New Contruction program to encourage building energy efficiency above code. The program was launched in late 2015.

4.2.2 Custom Rebates

- The Custom Building Efficiency Program (CBEP) provides custom rebates for larger, more complex energy efficiency retrofits and new construction projects in both the Commercial and Industrial sectors. In 2015, rebates for new construction continued to be offered based on building modeling, however, a new more accessible incentive pathway was developed for medium-sized buildings to provide lighting-only incentives based on lighting efficiency performance over building code;
- The Municipal Water Infrastructure program was discontinued as a discrete program and became part of CBEP. Incentives provided under this program include a city in the West Kootenays that received a $24,500 rebate for upgrading its water infrastructure equipment to achieve more efficient operations, saving 245 MWh per year.
- No CBEP/CPR projects materialized related to computer energy efficiency, but Smart Power Bar Strips that reduce power usage when computer periphials are not in use, will be offered as a part of the BIP program, launching in 2016.
- The Building Optimization Program, launched in 2013, provided re-commissioning and energy management information system support and continuous energy efficiency improvements to large multi-building institutional customers. In 2015, the final energy coaching phase began and the investigation and implementation phase was completed

for all participants. The program will be concluded in 2016 and its successor will launch as a joint Continuous Optimization program with FEI and BC Hydro.

4.3 *COMMERCIAL PROGRAMS PLANNED FOR 2016*

4.3.1 Business Direct Install (BDI) Program

FBC developed a successor to the 2011-2013 FortisBC Lighting Installation program (FLIP) direct install program that was co-funded by LiveSmartBC. An RFP was issued and a third party implementer was selected in the last quarter of 2015. The new BDI program is contractor-focussed, including provision of an energy assessment tool and sales training. BDI will provide point-of-sale rebates for the direct installation of lighting, HVAC, refrigeration, plug load and other end use measures. The BDI program is scheduled to launch in March 2016.

4.3.2 Multi-Unit Residential Building (MURB) Retrofit Program

FBC is developing a rebate program to encourage energy efficient retrofits for existing MURB stratas. The program is expected to launch in mid-2016.

4.4 *SUMMARY*

Commercial Program Area activity in 2015 successfully achieved 5.9 GWh of annual electricity savings and a positive TRC of 1.8.

The pillars of the Commercial program, delivering the bulk of savings, will continue to be the CPR and CBEP. The BDI program is expected to significantly increase savings in the small and medium business sector. Additional programs and offers launched in late 2015 and continued in 2016 will provide new offers to MURB and irrigation customers to improve their energy efficiency.

5. INDUSTRIAL PROGRAM AREA

5.1 OVERVIEW

The Industrial DSM programs continued to encourage industrial customers to consume electricity more efficiently in 2015. The Industrial programs achieved an overall TRC of 2.0, with electricity savings of 1.1 GWh. $1.3 million was invested, of which 65 percent was incentive spending. Throughout 2015, the Company worked to enhance program offerings and build relationships with key industry players.

Table 5-1 summarizes the plan and actual expenditures for the Industrial Program Area in 2015, including incentive and non-incentive spending, annual and lifetime electricity savings, as well as the TRC cost-effectiveness test results.

Table 5-1: 2015 Industrial Program Results Summary

Program Area	2015 Approved Plan Savings (MWh)	2015 Actual Energy Savings (MWh)	Lifetime savings (MWh)	Incentive Expenditure ($000)	Non-Incentive Expenditure ($000)	2015 Actual Spend ($000s)	2015 Approved Plan ($000s)	TRC
Industrial Efficiency	1,537	1,086.8	27,937	146.2	79.8	226.0	202	2.0
Industrial Total	**1,537**	**1,086.8**	**27,937**	**146.2**	**79.8**	**226.0**	**202**	**2.0**

The Industrial Efficiency program achieved savings of 1.1 GWh, or 71 percent of the 1.5 GWh Plan for 2015. This was an increase of 77% over 2014 savings (0.6 GWh) for the industrial sector. An example of an industrial energy efficiency project was a compressed air upgrade at a West Kootenay lumber mill, incented through CBEP, contributing 216 MWh of savings.

Industrial sector costs incurred by the Company were $226,040 for 2015, or 112 percent of Plan. The Industrial sector expenditures exceeded Plan while the savings fell short of Plan. The higher level of expenditure was due partly to costs for new program development and the ramp up of existing programs, which won't produce savings until 2016. The Industrial sector is also characterized by large projects that generally occur less frequently and take much longer to complete so the materialization of energy savings is frequently delayed.

5.2 2015 INDUSTRIAL PROGRAMS

CBEP provides custom rebates for larger, more complex energy efficiency retrofits, including, but not limited to, lighting, compressed air, hydraulics, industrial controls, fans and pumps. The eligibility policy and process structures continued to be improved in 2015. FBC developed new tracking and project management tools to reduce the lead time between project agreement, project implementation and issuance of the final rebate.

Activities in the Industrial programs resulted in three new funding agreements being executed, one of which included 246 MWh of industrial lighting electric savings. Program costs and

energy savings were dominated by the first phase of a large lumber mill modernization project in the West Kootenay region, which represented approximately 80 percent of program spend and savings.

FBC commercial and industrial Technical Advisors increased the number of site visits with industrial customers to promote the overall program.

5.3 *INDUSTRIAL PROGRAMS PLANNED FOR 2016*

5.3.1 Industrial Optimization Program

FBC developed two new joint energy assessment offers under FEI's existing Industrial Optimization Program:

- The Plant Wide Audit is a high level, whole facility audit to identify energy efficiency and both electric and natural gas conservation measures;
- The Feasibility Study is a detailed engineering study of a specific process or system to fully investigate opportunities to use energy from both electricity and natural gas, more efficiently.

These new industrial energy assessment offers will be available by March 2016 to FBC's industrial customers and the industrial customers of FBC's municipal wholesale customers who use in excess of 3 GWh per year. FBC will continue to provide incentives for implementation of industrial energy efficiency measures identified in the energy assessments through its existing CBEP program.

6. SUPPORTING INITIATIVES

6.1 *OVERVIEW*

Supporting initiatives support the goals of energy conservation in a variety of ways, from funding and supporting educational opportunities in schools to promoting energy conservation at community events.

To maximize internal efficiencies and minimize messaging duplication, the Company worked collaboratively with FEI for all initiatives except for a limited number of electricity-only outreach events. Budgets and other resources were coordinated to provide school and community outreach, retail campaigns, communications pieces and various event materials. The Company also supported various training seminars and educational workshops in collaboration with such organizations as the Canadian Home Builders' Association and other industry associations.

The Community Energy Planning program, described in further detail in section 6.2.1, was fully subscribed and will result in community or institutional strategic energy plans that will promote energy efficiency into the future.

The aforementioned activities are not incentive-based programs, therefore the Company has not attributed any direct savings to them. Supporting Initiatives costs are included at the portfolio level and incorporated into the overall portfolio cost-effectiveness results. Like FEI and other utilities, the Company is investigating opportunities to identify and confirm energy savings for future Supporting Initiatives activities.

The approved Supporting Initiatives expenditures for 2015 were $0.67 million and actual spending in 2015 was $0.35 million. The primary reason for the under-expenditure was the delay in overall program ramp-up from 2014.

6.2 *SUPPORTING INITIATIVES*

6.2.1 Community Energy Planning

The Company introduced a strategic Community Energy Planning pilot project to provide financial assistance to local governments and publically-funded institutions (up to 50 percent of project costs to a maximum of $20,000 per participant) to facilitate future energy efficiency activities. The offer was fully subscribed in 2015 with University of British Columbia Okanagan (UBCO), Okanagan College and eight local governments, in partnership with the Columbia Basin Trust, participating.

The Company's support of community planning processes was highly praised by participating organizations. It is anticipated that the energy plans that were completed, or will be finalized in mid-2016, will result in several upgrade projects, the incorporation of efficiency in new

construction projects, and/or the adoption of policies and program development to further promote energy efficiency.

6.2.2 Education Programs (elementary and secondary)

- Development of a curriculum-based elementary school program to be delivered in schools by classroom teachers in 2016;
- Energy is Awesome (curriculum-based education packages for educators and volunteer presenters);
- BC Lions Energy Champions program; and
- Financial sponsorship of Destination Conservation (Elements Society), Green Bricks and Beyond Recycling (Wildsight) programs.

6.2.3 Education Programs (post-secondary), including Trades Training

- Sponsorship of Selkirk College Red Bird Communications' campus energy conservation program;
- Sponsorship of Illumination Engineering Society Fundamentals of Lighting course, and grants for electricians and local contractors to participate; and
- Grant support for Certified Energy Manager (CEM) training.

6.2.4 Community Outreach

- Junior hockey game sponsorship: promotion of conservation in public venues;
- Sponsorship of community events, e.g., Rock Creek Fair, that promote energy efficiency;
- Attendance and seminar presentations to residential home shows, building supply and hardware retail outlets and commercial trade shows;
- Business Energy Savings Kits: pilot project for fire departments to provide energy efficiency measure give-aways and tips to small businesses; and
- Behaviour change on-line contest: The Conserver Club.

6.2.5 Sector Support

- In collaboration with BC Hydro and FEI, the Company assumed the MEM LiveSmart Business Efficiency Advisor (BEA) program and offered free walk-through audits for small commercial enterprises;
- As a program pilot, working jointly with the FEI Energy Specialist Program, the Company co-sponsored its first Energy Specialist position with the City of Kelowna to promote both natural gas and electricity energy efficiency projects. The Energy Specialist serves as

an in-house customer resource that supports the development and execution of energy efficiency projects that increase participation in energy efficiency programs; and

- Contractor Ally Program: support and education to contractors to promote energy efficiency products and rebate programs to their customers.

7. PLANNING AND EVALUATION

7.1 OVERVIEW

The BC-wide[4] dual-fuel Conservation Potential Review (BC CPR) got underway in 2015, following a rigorous procurement process in which the successful proponent was selected. The BC CPR is expected to yield draft economic potential results in the first quarter of 2016, followed by final reports in the second quarter. FBC will be provided with its own individual CPR report, and collectively the participating utilities' results will be rolled up into a provincial summary report to better inform public policy. A joint FBC-FEI Commercial End-Use Survey (CEUS) was completed in 2015 that provides a primary input to the BC CPR study.

The conversion of the DSM tracking and reporting system to the "cloud-based" Demand Side Management Central (DSMC) software was completed in 2015, with the configuration of six additional programs. DSMC is now the system of record for all of the Company's DSM projects and programs, thus completely replacing the previous Access database. System maintenance to add new DSM programs and respond to program changes is ongoing.

FBC continued to advance its Monitoring and Evaluation (M&E) activities in 2015 in alignment with the DSM Monitoring and Evaluation Plan 2013-15[5], as amended and extended for 2016[6]. Evaluation activities are undertaken at different stages of the program's lifecycle, when appropriate. The 2015 evaluation activities presented in Table 7.1 reflect the number of mature programs in the market and the level of studies required to provide program feedback.

7.2 2015 PROGRAM EVALUATION ACTIVITIES

Primary types of Evaluation, Measurement and Verification (EM&V) activities include: Process evaluations, where surveys and interviews of participants and trade allies are used to assess customer satisfaction and program success; Impact evaluations, to measure the achieved energy savings attributable from the program including free-ridership and spillover[7] impacts; and Measurement & Verification (M&V) activities, to confirm project specific energy savings associated with energy conservation measures. Secondary evaluation findings of market effects may be revealed through interviews of market players, such as trade allies.

FBC's evaluation activities for 2015 continued to focus on identifying energy savings, assessing participant awareness and satisfaction, barriers to participation, the effectiveness of education initiatives and conducting industry research regarding best practices. M&V activities were focused on identifying and verifying project and measure level savings assumptions and

[4] BC Utilities include FBC, FEI, BC Hydro and Pacific Northern Gas.
[5] FortisBC Inc. PBR Revenue Requirements 2014-2018 filing, Appendix H3.
[6] FBC Application for Demand Side Management (DSM) Expenditures for 2015 and 2016, s.6 and Appendix A5.
[7] Free-ridership refers to participants who would have participated in the absence of the program and spillover refers to additional reductions in energy consumption or demand that are due to program influences that are not directly associated with program participation, (as per National Renewable Energy Laboratory, http://www.nrel.gov/docs/fy14osti/62678.pdf).

understanding any issues associated with equipment installation in the field. M&V activities associated with specific projects, conducted by third party engineering consultants to verify installed measures and savings thereof, are included in the project costs and not in the portfolio level EM&V costs.

Table 7-1: 2015 DSM Program Evaluation and Research

Evaluation Name	Program Area	Type of Evaluation	Evaluation Partnership	Evaluation Status
Home Improvement Program	Residential	Comprehensive	None	Technical review, participant survey and contractor interviews conducted for program evaluation. **Completed in Q4 2015. Executive Summary of the final report by Evergreen Economics is included in Appendix C.**
Home Energy Rebate Offer (HERO) - Contractor Survey	Residential	Process	BC Hydro	Telephone survey of participating contractors by eNRG. **Completed December 2015. Data extracts only.**
Home Energy Rebate Offer (HERO) - Technical review	Residential	Impact and measure review	FEI and BC Hydro	**Presentation of data by Dunsky Energy Consulting, December 2015**
Energy Conservation Assistance Program (ECAP)	Low Income	Process	FEI and BC Hydro	Ongoing Quality Assurance to ensure all products are installed according to vetted installation policies and procedures.
Energy Savings Kit (ESK)	Low Income	Process	FEI and BC Hydro	Ongoing BC Hydro participant survey to assess customer satisfaction and program awareness.

7.3 PLANNING AND EVALUATION (P&E) EXPENDITURES

The actual P&E expenditure for 2015 was $585 thousand, or 81% of Plan as it is largely comprised of fixed salary costs.

The DSM Advisory Committee (DSMAC) did not meet in 2015, however two members of the DSMAC were recruited to the Long Term Electric Resouce Plan (LTERP) advisory group.

The P&E Plan was $140 thousand underspent largely due to postponed Evaluation activities for various reasons, as follows:

- The New Home (EnerGuide 80) program was replaced on August 1, 2015 by Energy Star for New Homes. Evaluation was postponed until the Energy Star for New Homes program has enough participants to provide meaningful process evaluation results.
- Custom Commercial Lighting program (planned to be combined with Low Income Direct Install Lighting) only had a handful of participants; insufficient to provide robust impact evaluation results.

The postponed evaluation activities will be rescheduled in due course, either as stand-alone reviews or in combination with similar programs.

7.4 EVALUATION REPORT – HOME IMPROVEMENT PROGRAM

The executive summary of the third party Evaluation report completed on the Home Improvement Program (HIP) in 2015 is included in Appendix C. The full report is provided in Confidential Appendix D separately requesting the Commission keep this report confidential.

The high level impact findings were as follows:

1. The report authors found a gross realization rate of 92% of the booked energy savings that indicated a sound technical basis for the measure savings.

2. The Net-to-Gross (NTG) ratio of 37.5% indicated a high free-ridership rate. The authors note that FortisBC's HIP program ran in parallel to the provincal LiveSmartBC program, that covered many of the same measures, and thus respondents may not have been able to distinguish between the influences of both programs when responding to the self-report survey questions.

Many of the HIP report findings and recommendations have already been incorporated into the successor program, the Home Energy Retrofit Offer (HERO). The following improvements, to trade ally and energy assessor communications, were implemented in 2015 to address Recommendation #5 of the HIP report:

1. Development of a contractor directory to help to meet customers' needs by geographically being able to connect with a qualified contractors in their hometown;

2. Sending regular emails and newsletters to keep contractors informed about program news, incentive levels, industry information and other valuable updates. These communications allow them to be ambassadors for FBC's programs;

3. Participation in annual mini-trade shows in conjunction with the Trade Alley Network; and

4. Contractor ad hoc meetings. FBC occasionally meets with contractors to get their feedback on program incentives and design.

Appendix A

DSM PROGRAMS COST AND SAVINGS SUMMARY REPORT

Table A-1: FBC DSM Summary Report for Year Ended December 31, 2015

Program Area	2015 Approved Plan Savings (MWh)	2015 Actual Energy Savings (MWh)	Lifetime savings (MWh)[2]	Incentive Expenditure ($000)	Non-Incentive Expenditure ($000)	2015 Actual Spend ($000s)	2015 Approved Plan ($000s)	Benefit/Cost Tests			Levelized cost (¢/kWh)
								TRC	UCT	RIM	
Residential											
Home Improvement	3,106	231.2	6,326	62.0	136.8	198.7	884	1.7	1.7	0.7	7.1
Behavioural	888	0.0				-	85				
Watersavers	850	4.6	64	0.3	1.8	2.2	387	1.5	3.2	1.0	10.8
Appliances	288	51.9	865	23.3	47.7	71.0	96	1.2	1.5	0.9	17.9
Lighting	1,569	4,144.4	50,893	167.9	30.1	198.0	193	5.3	26.5	1.1	2.1
Heat Pumps	1,618	569.0	17,561	138.4	44.1	182.5	302	1.5	4.3	0.9	7.9
New Home Program	1,179	356.2	12,366	37.6	73.2	110.8	390	1.1	5.1	0.9	10.2
Low Income Housing	2,598	281.8	1,827	97.5	189.9	287.3	824	1.3	0.9	0.6	9.7
Residential Total	**12,096**	**5,639.0**	**89,903**	**526.9**	**523.5**	**1,050.4**	**3,160**	**2.9**	**7.0**	**1.00**	**4.0**
Commercial											
Lighting	7,445	4,089.3	71,188	404.4	331.0	735.4	1,485	2.0	5.7	1.0	6.0
Building Improvement	3,454	1,605.9	41,841	175.8	367.3	543.0	842	1.6	4.3	1.0	8.3
Computers	378	0.0		-	-	-	55				
Municipal (WWTP)	759	186.6	4,900	24.5	11.7	36.2	79	2.3	5.5	0.9	5.0
Irrigation	490	0.0		-	9.0	9.0	69				
Commercial Total	**12,526**	**5,881.8**	**117,929**	**604.7**	**719.0**	**1,323.7**	**2,530**	**1.8**	**5.2**	**1.0**	**6.7**
Industrial											
Industrial Efficiency	1,537	1,086.8	27,937	146.2	79.8	226.0	202	2.0	6.2	1.0	5.7
Industrial Total	**1,537**	**1,086.8**	**27,937**	**146.2**	**79.8**	**226.0**	**202**	**2.0**	**6.2**	**1.0**	**5.7**
Total Programs	**26,159**	**12,607.6**	**235,769**	**1,277.8**	**1,322.3**	**2,600.1**	**5,892**	**2.2**	**6.0**	**1.0**	**5.3**
Portfolio Level Activities											
Planning & Evaluation	-	-		-	584.9	584.9	725				
Supporting Initiatives	-	-		-	346.3	346.3	675				
Total Portfolio	**26,159**	**12,607.6 [1]**	**235,769**	**1,277.8**	**2,253.5**	**3,531.3**	**7,292**	**2.0**	**4.4**	**0.9**	**6.0**

[1] Commensurate Demand Savings are 2.6 MW

[2] Lifetime savings are energy savings over the lifetime of the measure

Appendix B

HISTORICAL SUMMARY OF DSM COST AND ENERGY SAVING RESULTS

FORTISBC INC.

ELECTRICITY DEMAND-SIDE MANAGEMENT PROGRAMS 2015 ANNUAL REPORT

APPENDIX B – HISTORICAL SUMMARY OF DSM COST AND ENERGY SAVING RESULTS

Table B-1: Historical FBC DSM Costs and Energy Savings 2010-2014

		2010 (Actual)							2011 (Actual)						
		Spend ($000s)			Energy Savings (MWh)			TRC[3]	Spend ($000s)			Energy Savings (MWh)			TRC[3]
		Planned	Actual	Variance	Planned	Actual	Variance	(B/C)	Planned	Actual	Variance	Planned	Actual	Variance	(B/C)
1	**Residential**														
2	Home Improvements	294	434	(140)	953	4,948	3,995	3.1	2,145	479	1,666	8,960	3,692	(5,268)	1.6
3	Building Envelope[1]														
4	Heat Pumps	624	749	(125)	6,377	3,239	(3,138)	1.2	694	532	162	3,397	2,257	(1,140)	1.0
5	Residential Lighting	243	278	(35)	2,383	2,589	206	2.4	438	239	199	3,420	3,308	(112)	2.2
6	New Home Program	254	247	7	1,392	477	(915)	1.1	54	205	(151)	105	689	584	1.0
7	Appliances[1]														
8	Electronics[1]														
9	Water Heating[1]														
10	Low Income[1]	100	131	(31)	1,000	385	615	0.7	305	245	60	540	1,447	(907)	1.0
11	Behavioural[1]														
12	*Residential Total*	**1,515**	**1,838**	**(323)**	**12,105**	**11,638**	**764**	**1.9**	**3,636**	**1,700**	**1,936**	**16,422**	**11,393**	**(6,843)**	**1.3**
13	**Commercial**														
14	Lighting	722	526	196	5,304	7,971	2,667	3.5	1,114	1,995	(881)	7,370	20,577	13,207	2.3
15	Building and Process Improvements	658	597	61	6,751	6,685	(67)	1.5	572	606	(34)	3,010	1,386	(1,624)	0.7
16	Computers														
17	Municipal (Water Handling)[2]								432	231	201	3,560	2,199	(1,361)	1.6
18	Irrigation[2]														
19	*Commercial Total*	**1,380**	**1,123**	**257**	**12,055**	**14,655**	**2,600**	**2.1**	**2,118**	**2,832**	**(714)**	**13,940**	**24,162**	**10,222**	**1.9**
20	**Industrial**														
21	Compressed Air	87	25	62	938	114	(823)	0.7							
23	EMIS								10	9	1	80	-	(80)	-
22	Industrial Efficiencies	302	216	86	2,412	2,853	441	2.1	603	128	475	9,280	794	(8,486)	2.5
24	*Industrial Total*	**389**	**241**	**148**	**3,350**	**2,967**	**(383)**	**2.0**	**613**	**137**	**476**	**9,360**	**794**	**(8,566)**	**2.4**
25	**Programs Total**	**3,284**	**3,203**	**81**	**27,510**	**29,261**	**2,981**	**2.1**	**6,367**	**4,669**	**1,698**	**39,722**	**36,349**	**(5,187)**	**1.8**
26	Supporting Initiatives	148	155	(7)	-	-	-		725	658	67	-	-	-	-
27	Planning & Evaluation	519	354	165	-	-	-	-	750	590	160	-	-	-	-
28	**Total**	**3,951**	**3,712**	**239**	**27,510**	**29,261**	**2,981**	**2.0**	**7,842**	**5,918**	**1,924**	**39,722**	**36,349**	**(5,187)**	**1.6**

[1] These programs were included in Home Improvements program

[2] Irrigation was included in Municipal (Water Handling) and in 2010, Municipal (Water Handling) was part of Building and Process Improvement

[3] Benefits calculated using RS3808 applicable at the time

Table B-2: Historical FBC DSM Costs and Energy Savings 2010-2014

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		2012 (Actual)							2013 (Actual)							
		Spend ($000s)			Energy Savings (MWh)			TRC	Spend ($000s)			Energy Savings (MWh)			TRC	mTRC
		Planned	Actual	Variance	Planned	Actual	Variance	(B/C)	Planned	Actual	Variance	Planned	Actual	Variance	(B/C)	(B/C)
1	**Residential**															
2	Home Improvements	1,719	637	1,082	7,620	4,656	(2,964)	1.7	1,961	725	1,236	8,680	5,222	(3,458)	1.7	1.8
3	Building Envelope[1]															
4	Heat Pumps	703	636	67	3,397	2,161	(1,236)	1.0	698	532	166	3,397	2,100	(1,297)	1.3	1.9
5	Residential Lighting	328	337	(9)	2,530	2,599	69	1.8	313	473	(160)	2,467	3,300	833	1.4	1.4
6	New Home Program	43	314	(271)	90	1,040	950	1.4	45	782	(737)	93	3,000	2,907	1.9	1.9
7	Appliances[1]	247	332	(85)	690	1,248	558		267	241	26	739	578	(161)		
8	Electronics[1]															
9	Water Heating[1]															
10	Low Income	677	308	369	1,774	1,054	(720)	1.3	660	415	245	1,570	2,000	(430)	1.6	1.6
11	Behavioural[1]															
12	*Residential Total*	**3,717**	**2,564**	**1,153**	**16,101**	**12,758**	**(3,343)**	**1.5**	**3,944**	**3,168**	**776**	**16,946**	**16,200**	**(1,606)**	**1.6**	**1.8**
13	**Commercial**															
14	Lighting	1,157	2,152	(995)	7,390	14,256	6,866	2.2	1,170	1,235	(65)	7,140	7,600	460	2.0	2.0
15	Building and Process Improvements	659	612	47	3,410	1,959	(1,451)	1.3	738	594	144	3,730	2,600	(1,130)	1.6	1.6
16	Computers															
17	Municipal (Water Handling)	383	255	128	2,580	1,677	(903)	2.6	177	80	97	1,110	700	(410)	1.4	1.4
18	Irrigation[2]															
19	*Commercial Total*	**2,199**	**3,019**	**(820)**	**13,380**	**17,892**	**4,512**	**2.0**	**2,085**	**1,909**	**176**	**11,980**	**10,900**	**(1,080)**	**1.8**	**1.8**
20	**Industrial**															
21	Compressed Air															
23	EMIS	27	10	17	190	-	(190)	2.0	41	17	24	290	-	(290)	-	-
22	Industrial Efficiencies	323	163	160	2,290	937	(1,353)	-	323	307	16	2,290	2,500	210	1.0	1.0
24	*Industrial Total*	**350**	**173**	**177**	**2,480**	**937**	**(1,543)**	**1.9**	**364**	**324**	**40**	**2,580**	**2,500**	**(80)**	**1.0**	**1.0**
25	**Programs Total**	**6,266**	**5,756**	**510**	**31,961**	**31,587**	**(374)**	**1.8**	**6,393**	**5,401**	**992**	**31,506**	**29,600**	**(2,766)**	**1.9**	**2.0**
26	Supporting Initiatives	725	816	(91)	-	-	-	-	725	706	19	-	-	-	-	-
27	Planning & Evaluation	740	728	12	-	-	-	-	760	748	12	-	-	-	-	-
28	**Total**	**7,731**	**7,300**	**431**	**31,961**	**31,587**	**(374)**	**1.6**	**7,878**	**6,855**	**1,023**	**31,506**	**29,600**	**(2,766)**	**1.6**	**1.7**

[1] These programs were included in Home Improvements program

[2] Irrigation was included in Municipal (Water Handling)

Table B-3: Historical FBC DSM Costs and Energy Savings 2010-2014

		1	2	3	4	5	6	7	8
		2014 (Actual)							
		Spend ($000s)			Energy Savings (MWh)			TRC	mTRC
		Planned	Actual	Variance	Planned	Actual	Variance	(B/C)	(B/C)
1	**Residential**								
2	Home Improvements	295	391	(96)	1,881	1,299	582	1.5	1.5
3	Heat Pumps	158	252	(94)	553	865	(312)	1.6	1.6
4	Residential Lighting	176	291	(115)	2,136	3,411	(1,275)	1.5	1.5
5	New Home Program	67	254	(187)	98	733	(635)	2.7	2.7
6	Appliances[1]	-	-	-	-	-	-		
7	Water Heating	99	3	96	425	92	333		
8	Low Income	242	502	(260)	707	2,286	(1,579)	1.9	1.9
9	Behavioural[1]			-			-		
10	*Residential Total*	**1,037**	**1,694**	**(657)**	**5,800**	**8,686**	**(2,886)**	**1.7**	**1.7**
11	**Commercial**								
12	Lighting	510	646	(136)	3,359	3,353	6	2.0	2.0
13	Building and Process Improvements	592	533	59	2,641	1,926	715	1.4	1.5
14	Municipal (Water Handling)	-	5	(5)	-	-	-		
15	Irrigation	32	-	32	200	-	200	0.0	0.0
16	*Commercial Total*	**1,134**	**1,184**	**(50)**	**6,200**	**5,279**	**921**	**1.6**	**1.7**
17	**Industrial**								
18	Compressed Air[2]			-					
19	Industrial Efficiencies	148	188	(40)	800	614	1,121	1.2	1.2
20	*Industrial Total*	**148**	**188**	**(40)**	**800**	**614**	**2,041**	**1.2**	**1.2**
21	**Programs Total**								**2.0**
22	Supporting Initiatives	190	207	(17)					-
23	Planning & Evaluation	492	579	(87)					-
24	Recoveries from 2013		(378)	378					
25	**Total**	**3,001**	**3,473**	**(472)**	**12,800**	**14,580**	**75**	**1.6**	**1.7**

[1] These programs were included in Home Improvements program

[2] Compressed Air was included in Industrial Efficiencies

Appendix C

EVALUATION OF THE FORTISBC HOME IMPROVEMENT PROGRAM EXECUTIVE SUMMARY

EVERGREEN ECONOMICS

Evaluation of the FortisBC Home Improvement Program

Prepared for FortisBC Inc.

December 14, 2015

Dr. Phil Willems / PWP

1 Executive Summary

1.1 Introduction

This report presents the findings of the impact and process evaluation of the FortisBC Home Improvement Program covering the 2012-2014 period. This program was designed to provide rebates for residential customers pursuing energy efficiency upgrades to their homes, including lighting, window, insulation, and other common household measure projects. Customers received the rebate by completing a FortisBC mail-in rebate form after purchasing a qualifying measure.

The evaluation relied on several data collection and analysis methods to complete the impact and process research:

- **Engineering analysis**. The Evergreen team reviewed the background information and technical assumptions used to determine the deemed savings for all measures covered by the Home Improvement Program. Recommendations for changing savings parameters are made where appropriate based on this review.

- **Participant phone surveys**. A phone survey was conducted on a sample of program participants (n=150). These surveys were used primarily to collect feedback on the program experience as part of the process evaluation.

- **Self-report free-ridership analysis.** A separate component of the participant phone survey was a battery of questions asking what equipment would have been installed if the FortisBC program had not been available. Responses for these questions were scored and used to create an estimate of program free-ridership.

- **Participating Contractor interviews**. Interviews were conducted with contacts provided by FortisBC (n=5) to evaluate the effectiveness of the program's design and delivery. Some of these responses were also used to create the estimate of net program impacts.

Details on each of these analysis methods and the evaluation estimates they produced are discussed below.

1.2 Impact Evaluation Results

1.2.1 Engineering Review

The engineering review examined the background and technical assumption used to develop the deemed savings values for the Program (HIP). General topic areas that were covered in the engineering review included:

- Lighting Upgrades
- Energy Star Appliances
- Insulation
- Windows
- Programmable Thermostats
- Heat Pumps

- Water Heaters

In general, the deemed savings values for this program in all these areas were documented reasonably, however, including proper citations would improve the usability and credibility of the documentation considerably. Additionally, the deemed savings values were generally found to be reasonable for using one value for all types of installations. However, there were several measures where the evaluation team recommended significant changes. Finally, the evaluation team provided several recommendations for breaking down the savings claimed by different metrics such as heating system type or building type to improve accuracy and allow the program additional flexibility.

1.2.2 Net Impact Analysis

The net impact analysis utilized a participant self-report survey method combined with information from the contractor interviews to estimate a free ridership rate for the program. For the purposes of this analysis, free-ridership measures the rate at which program participants would have installed the same program-qualifying equipment or taken the same action (e.g., installed energy efficient lighting) in the absence of the program. Information needed to support this approach was collected as part of the participant phone survey.

The self-report method calculates free-ridership as the sum of two components:

- The influence of program-related factors on a customer's decision to install equipment, termed the Program Influence Score, which can take on a value from 0 to 0.5; and
- The customer's description of actions they would have taken had the program not existed, termed the Change Score, which can also take on a value of 0 to 0.5.

The values for the two scores are determined from participant responses to survey questions, and summed to estimate a self-report free-ridership rate ranging from 0 to 1.0.

Additionally, to supplement the self-report method and assess the free-ridership rate from the perspective of vendors who provided equipment through the program, results from the contractor interviews were used to estimate sales of program qualifying measures in the absence of the program.

The contractor-response method calculates free-ridership using the following steps:

1. Asking contractors to provide the approximate number of residential projects they completed in 2014
2. Asking contractors what percentage of those projects were purchased through the Home Improvement Program
3. Multiplying the percentage of projects purchased through the program by the number of projects to calculate the number of projects completed through the program
4. Multiplying contractor estimates of the percentage of customers who would have purchased the same program qualifying equipment even without the program rebate by the number of projects completed through the program

5. Summing the number of projects calculated in Step 4 and dividing by the total number of projects calculated in Step 3 to estimate free-ridership as the number of projects that would have used program qualifying equipment even without the program as a percentage of the total projects completed through the program

The results from the participant self-report and contractor-response methods were averaged to calculate free-ridership and net-to-gross adjustment factors (1 – free-ridership rate) for the program.

1.2.3 Combined Impact Evaluation Results

Savings for the Home Improvement Program are calculated using each of the analysis components discussed above and are summarized in Table ES-1 for both energy (kWh) and demand (kW). The Gross Realization Rate is based solely on the engineering adjustments as applied to the current participant population. The weighted net-to-gross ratio is calculated as 1 minus the program free-ridership rate.

To calculate the final savings for the program, the ex ante savings are multiplied by the Gross Realization Rate to determine Gross Annual Savings. This value is then multiplied by the net-to-gross ratio determined from the phone survey data to obtain Net Annual Savings. The Final Realization Rate (0.35) is obtained by dividing the Net Annual Savings value by the original ex ante savings total. As previously discussed, the Final Realization Rate is relatively small for the Home Improvement Program because of the high self-reported free ridership and resulting low net-gross-ratio.

Table ES-1: Summary of Gross and Net Savings

	Ex Ante Electrical Savings	Gross Realization Rate (%)	Gross Annual Savings	Net-to-Gross Ratio (Weighted)	Net Annual Savings	Final Realization Rate
Energy (kWh)	2,994,643	92.2%	2,760,732	0.375	1,035,274.5	34.6%
Demand (kW)	2,836	81.4%	2,307.9	0.375	865.5	30.5%

Source: Analysis by Evergreen Economics of impact evaluation results combined with participation data provided by FortisBC.

1.3 Process Evaluation

In addition to the impact analysis, the Evergreen team conducted a process evaluation of the Home Improvement Program. To accomplish this, the process evaluation had two primary analysis components:

1. **Participant phone survey.** A phone survey was conducted that targeted program participants over the 2012-2014 period.
2. **Participating Contractor interviews**. Interviews with participating FortisBC Home Improvement Program Contractors – specifically windows/door and insulation contractors – were completed to provide additional perspectives on the functionality and success of the program.

In August 2014, a phone survey was conducted among end-use customers that participated in the Home Improvement Program during the 2012-2014 period. From a total sample frame of 660 participants, we were able to obtain 150 completed surveys for a response rate of approximately 23 percent. To support the process evaluation, this survey covered a variety of topics including the program participation process, expected energy savings and overall satisfaction with the program.

Overall, a majority of homes were built between 1960 and 2000 (68 percent), with 38 percent of those built between 1960 and 1980 and 30 percent built between 1980 and 2000. Additionally, 53 percent of participants' homes were between 2,000 and 5,000 square feet, 39 percent were between 1,000 and 1,999 square feet, and 8 percent were less than 1,000 square feet.

Among the 150 survey participants, 174 total measures were purchased, as 24 participants said they purchased multiple measures that were eligible for a FortisBC rebate through the Residential Home Improvement Program. Within the 174 measures, 49 percent were windows or doors, 16 percent was insulation, 14 percent were bathroom fans, and an additional 14 percent were thermostats. A majority of participants said they were replacing an existing piece of equipment when purchasing the rebate-eligible measure. The measures were general installed by contractors or electricians (51 percent) however, 30 percent of participants installed the measures themselves.

A vast majority of participants (89 percent) said they were unsure of how much they expected to save on their energy bill from installing the energy efficiency upgrade. Those that did have an expectation, generally estimated between 10 and 49 percent savings on their energy bill. Following the installation, a large majority of participants still did not know how their energy bills had changed since the installation. 36 percent of participants said they did not know if their energy bills were about what they expected, while another 90 percent of customers that provided an actual expected savings amount also said they did not know what they were actually saving.

In general, participants across all measures were very satisfied with their new measure, with average more than 90 percent of participants rating their satisfaction between 8 and 10 on a 10-point scale, where 1 is not at all satisfied and 10 is very satisfied.

In addition to the participant phone surveys, the Evergreen team also conducted in-depth interviews with participating program contractors – specifically those focused on windows and doors or insulation. In June of 2015, Evergreen Economics spoke with five contractors about their experiences with the program, focusing primarily on the following main topics:

- Company demographics
- Program awareness
- Customer outreach and marketing
- Project & Program processes
- Program involvement
- Overall feedback

Four of the contractors worked primarily on insulation projects, while one contractor focused on window and door installations. Overall, activity level ranged dramatically across participating contractors, as some contractors had completed over 100 projects through the Home Improvement Program while others had completed only a handful.

As expected, the more active contractors indicated high levels of satisfaction with the program, specifically the rebate levels and ease of administrative burden. Contractors suggested that increased marketing efforts by FortisBC could help increase customer awareness and participation in the Home Improvement Program and other similar residential rebate programs.

1.4 Conclusions and Recommendations

The following conclusions are derived from the FortisBC Home Improvement Program Evaluation; these conclusions are accompanied by recommendations to improve the Home Improvement Program offering.

Improve the documentation for the HIP deemed savings. The overall documentation was usable and sufficient, but could be improved to provide more relevant sources and citations.

Recommendation #1: Properly cite all sources referenced when developing deemed savings including the title of the report, author, page number referenced, along with a web address if available.

The lighting savings will need to be updated to account for increased lighting standards enforced in Canada. Lighting efficiency standards were adopted and came into effect in 2014 and 2015. As a result, the baseline wattage for all incandescent lamps under 100W will be decreasing. These standards will impact the savings for both CFL and LED lamp types going forward.

Recommendation #2: Savings calculated in 2015 should use replace 100W and 75W baselines with 72 W and 53 W, respectively. Additionally, looking ahead into 2016, the program should make an additional adjustment to reduce the baseline wattages from 60 W and 40 W to 43 W and 29 W, respectively.

The deemed savings for windows, programmable thermostats, and bathroom ventilation fans appear to be too high. Based on the engineering review, the deemed savings for these measures are higher than what was found in the literature, and what is consistent with the Evergreen team's engineering judgment.

Recommendation #3: Update the deemed savings values for these measures to the values recommended in the body of the report. These savings were based on data found from similar jurisdictions and national Canadian organizations.

Separating appliance, window, and insulation savings would increase accuracy and flexibility. Currently a single value for all appliance, window, or insulation measures is claimed. While this provides easy data tracking, separating out the claimed savings values by varying metrics would improve the

accuracy of the deemed savings. Additionally, it could provide additional program design flexibility to the program for future program modifications.

Recommendation #4: Separate out the savings by appliance type to improve the accuracy. Consider separating the window savings by building type and baseline window type to improve accuracy and program flexibility. Consider separating the savings for insulation measures by insulation location and baseline insulation level to increase accuracy and program flexibility.

Participating contractors reported high levels of overall satisfaction with the Home Improvement Program but noted that communication could be improved between FortisBC, contractors, and EnerGuide Assessors. Several participating contractors had little or no interactions with FortisBC representatives or EnerGuide Assessors over the course of participating in the program. As a result, some contractors mentioned they would like more interactions between program members to increase communication efforts in regards to program changes and updates.

Recommendation #5: Increase the number of interactions between FortisBC, program contractors, and EnerGuide Assessors through monthly or quarterly email updates and training seminars along with additional FortisBC service reps that prioritize meeting with contractors in person on a semi-regular basis.

Contractors found a lack of promotional material for the Home Improvement Program. Contractors said that because customers are familiar with the FortisBC name, the Home Improvement Program could benefit from increased advertisements from FortisBC that clearly state the available rebates and where the rebates are coming from

Recommendation #6: Consider increasing promotional material for the Home Improvement Program and other similar residential rebate programs going forward to increase customer awareness and participation. Additionally, consider providing promotional material – with the FortisBC logo included – directly to contractors so they have material to show their customers regarding potential rebates.

Across all measures, the weighted net-to-gross ratio was 0.375 for the Home Improvement Program. The low net-to-gross ratio is a direct impact of the high self-reported free ridership among participants. Over 95 percent of participants said they were planning on purchasing their energy efficient equipment prior to learning about the FortisBC rebate offering.

Recommendation #7: Consider revising the qualifying measures for the Home Improvement Program to increase the net-to-gross ratio. Measures such as windows, insulation, thermostats, and bathroom fans are well established in the market, relatively inexpensive in certain cases, and are commonly purchased as part of a scheduled household upgrade or retrofit, regardless of available rebates or incentives in the market. As a result, these measures dramatically increase free ridership and consequently decrease the program's net-to-gross ratio.

Appendix D

EVALUATION OF THE FORTISBC HOME IMPROVEMENT PROGRAM

FILED CONFIDENTIALLY

Appendix C

DEFERRED CAPITAL EXPENDITURE STUDY

FortisBC, Inc.

Deferred Capital Expenditure Study

July 2016

Prepared by:

570 Kirkland Way, Suite 100
Kirkland, Washington 98033

A registered professional engineering corporation with offices in
Kirkland, WA and Portland, OR

Telephone: (425) 889-2700 Facsimile: (425) 889-2725

www.eesconsulting.com

July 5, 2016

Mr. Keith Veerman
FortisBC, Inc.
1975 Springfield Road, Suite 100
Kelowna, BC V1Y 7V7

SUBJECT: Deferred Capital Expenditure Report

Dear Mr. Veerman:

EES Consulting, Inc. (EES) is pleased to submit a final report for the Deferred Capital Expenditure (DCE) on behalf of FortisBC. We would like to acknowledge and thank you and your staff for the excellent support in developing and providing the data for this project.

Very truly yours,

Anne Falcon
Senior Associate

570 Kirkland Way, Suite 100
Kirkland, Washington 98033

Telephone: 425 889-2700 Facsimile: 425 889-2725

A registered professional engineering corporation with
offices in Kirkland, WA and Portland, OR

Contents

Introduction

EES Consulting (EES) is pleased to provide you with a final draft report summarizing the results of our research and calculation of the Deferred Capital Expenditure (DCE) factor. FortisBC plans to use this DCE factor to estimate the "avoided" transmission and distribution (T&D) costs due to the implementation of demand-side management (DSM) programs. The recommended Marginal Cost methodology was selected based on the literature review of the common methodologies used to determine avoidable T&D expenditures due to DSM program implementation. Based on FortisBC's forecast growth-related capital T&D expenditure schedules and annualizing factors obtained from FortisBC, this study found the levelized T&D DCE values to be $67.03 and $12.83 respectively in 2015 dollars.

As part of the evaluation of the cost-effectiveness of demand-side management resources, utilities are including the avoided infrastructure costs for deferred transmission and distribution costs. Based on a recent survey[1] by the (ACEEE) 82 percent of the states surveyed include avoided T&D costs in the benefit-cost analysis of DSM programs.

According to the Regulatory Assistance Project's 2011 report *Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements*: "The capital cost of augmenting transmission capacity is typically estimated at $200 to $1,000 per kilowatt, and the cost of augmenting distribution capacity ranges between $100 and $500 per kilowatt. Annualized values (the average rate of return multiplied by the investment over the life of the investment) are about 10 percent of these figures, or $20 to $100 per kilowatt-year for transmission and $10 to $50 per kilowatt-year for distribution. There are also marginal operation and maintenance costs for transmission and distribution capacity, but these are modest in comparison to the capital costs."[2]

This report explores the methodologies available when assessing the deferred, or avoided, transmission and distribution costs, provide an overview of methodologies and values used by several utilities in the U.S. and Canada, and recommend a calculation and value to be used going forward for FortisBC DSM assessments.

Estimating Avoided Transmission and Distribution (T&D) Costs

DSM has the potential to reduce or delay infrastructure investments in a utility's transmission and distribution systems. In particular, DSM can defer T&D investments that are driven by economic conditions and growing peak loads.

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[1] "A National Survey of State Policies and Practices for the Evaluation of Ratepayer-Funded Energy Efficiency Programs" http://aceee.org/research-report/u122

[2] Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements RAP, p. 6.

In the context of DSM, avoided costs are the costs that are avoided by the implementation of an DSM measure, program, or practice. Such costs are used in benefit-cost analyses of DSM measures and programs. Different elements of the T&D system can experience peak demand at different times of the day and even in different seasons. Thus, the extent to which an efficiency program can help defer T&D investment will depend on the hour and season of peak and the hourly and seasonal profile of the efficiency program's savings. In order for DSM programs to defer T&D investments, the DSM programs would need to impact loads during the peak hour on the transmission or distribution system. NV Energy, for example, assumes that 25 percent of the annual growth-related T&D costs can be avoided due to DSM programs.

The calculation of distribution avoided cost is particularly complicated because the distribution grid has been built for all existing customers and the main purpose is to provide reliability to customers. As a result, the maximum avoided cost may only be realized in areas of grid expansion due to load growth. Even in areas of growth, distribution system costs can be avoided only when the DSM programs are included in the design process, and the utility is planning to rely on these programs as a resource. Considerable avoided costs may also be realized where utilities can avoid replacing or upgrading aging equipment needed to support load growth.

In order to maximize the avoided T&D cost, targeted DSM programs can be implemented in specific locations due to constraints or the need for significant infrastructure investments.[3] However, these non-wires solutions[4] to T&D investments are specifically designed programs, rather than general DSM programs for the residential, commercial or industrial end-user. They will generally result in much higher avoided costs than are used for overall DSM cost-effectiveness evaluations.

This paper does not examine the avoided T&D costs by DSM program or for targeted distribution programs specific for the FortisBC system. Instead, it explores the different methods used by various jurisdictions in the U.S. and Canada to determine the avoided T&D costs when evaluating overall DSM programs.

Based on the survey of methodology and DCE results, the following best practices can be concluded:

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[3] See for example *Energy Efficiency as a T&D resource: Lessons from recent US efforts to use geographically targeted efficiency programs to defer T&D investments*, Northeast Energy Efficiency Partnership January 9, 2015.

[4] Non-wires solutions can include for example energy efficiency, demand reduction initiatives, pricing strategies and distributed generation solutions.

- Use methodology based on specific utility data available. Estimated deferred T&D investments can vary considerably depending on the region and the utility system. Therefore, the best option for FortisBC is to estimate T&D DCE based on FortisBC data.
- Separate the calculation of transmission and distribution capital deferred expenditures and provide a DCE for each function if data is available.
- For each function (transmission and distribution) evaluate the potential on-peak impact of the potential conservation programs.
- While benchmarking may be indicative, benchmarking DCE results for FortisBC outside Western Electricity Coordinating Council (WECC) does not appear to be appropriate[5].
- Using a marginal costing approach appears to be the most common calculation methodology.

[5] Customer usage patterns, energy efficiency programs and transmission and distribution system constraints are different outside WECC than what is faced by FortisBC.

Avoided T&D Cost Estimation Methodologies

This section of the report provides more information on each of the methodologies commonly used to value avoided T&D expenditures.

Overview

In general, there are five different methods used to estimate the avoided T&D costs to be included in the benefit calculation of DSM programs. Many utilities calculate the avoided costs for transmission and distribution separately as the investment in these systems are different over time. The most common calculation methods are the following:

- Marginal avoided costing: estimates avoided capital costs based on the cost of adding one additional MW. This method can be performed based on a regression or based on an average of forecasted investments.

- Average investment: estimates the average amount of capital investment deferred based on the reduction of peak load and average transmission and distribution expansion costs.

- Market value: for utilities that rely on a market for transmission capacity, the market price can be used to determine the avoided transmission cost.

- Scenario-based estimation: estimates infrastructure investments with and without the DSM program. This methodology is very data intensive and the results are highly dependent on the DSM programs evaluated.

- Benchmarking: estimates are based on results from other utilities.

Each of these methods is further described below.

Marginal Cost Method

The marginal cost reflects the savings associated with a decrease of one MW either permanently or as a deferral in costs. There are two methods that can be used to estimate the marginal cost: average forecasted value or a regression technique.

The average forecasted value relies on the utility's forecast of transmission and distribution system upgrades and expansions, and the projected peak loads increases over the same time period (typically 5-10 years). The total investments over the analysis period is then divided by the total peak increases over the same period. This calculation results in a $/kW for the analysis period. This value is then annualized by applying a carrying cost factor based on the utility's cost of capital and the length of the analysis period. Some utilities only include the investment cost in the avoided cost estimate while other utilities also include associated

avoided operation and maintenance (O&M) costs. The marginal cost method, however, is not responsive to the timing of investments or load growth, rather it considers only their cumulative effect over the planning period.

A marginal unit capital cost can also be determined by regressing the cumulative changes in investment with cumulative changes in load. The marginal unit capital cost is then annualized by using a carrying cost factor and may be grossed up for marginal expenses. Although the regression method is accurate for calculating historical marginal costs, it is predicated on the assumption that the future will resemble the past. Because of this reliance on historical data, many have found that the regression methods are unsuitable for DSM cost-effectiveness evaluations.

Average Investment Method

The average investment method computes an arithmetic average by dividing the historical investment by the load growth during the same period. The resulting unit marginal cost is then annualized using a carrying charge factor. The carrying charge factor annualizes the marginal cost by calculating the weighted return on investment for the utility after taxes. Similar to the marginal cost method using regression analysis, the issue with this methodology is that it assumes that the historic average will reflect necessary investments in the future.

Market Value

For some utilities, it is possible to determine the avoided cost of transmission based on a market proxy. This is particularly relevant for utilities that do not own their own transmission system, but rather they purchase transmission services from other parties. For example, FortisBC wheels power over BC Hydro's transmission system using Rate Schedule 3817. The annual wheeling rate ranges between $13,734.87 and $56,199.12 per MW of nominated wheeling demand. This translates to approximately $13.73 - $56.20 per kW-yr in transmission wheeling costs. DSM capacity savings on peak would therefore avoid between $13.73 and $56.20 per kW-yr based on BC Hydro's transmission tariff.[6]

Scenario Method

In practice, the impact of DSM on the transmission and distribution system will vary considerably based on the location, type of program, customer mix, and other factors. Initially, the impact of these factors suggest a need to conduct in-depth studies of the transmission and distribution system. The optimum analysis would develop feeder level forecasts of the change or delay in investments and peak growth from specific DSM programs. Corresponding avoided costs can then be computed in a bottom-up manner using actual component costs or location specific planning costs.

[6] BC Hydro Transmission tariff. https://www.bchydro.com/about/planning_regulatory/tariff_filings/oatt/general-wheeling.html

However, this type of analysis is very time consuming and requires a combination of engineering judgment and multiple software simulations to examine the potential changes in the transmission and distribution systems due to DSM programs. This method is, therefore, not a viable option unless the utility is implementing a targeted program specifically used to address localized transmission or distribution limitations.

Benchmarking

The final option that has been used by many jurisdictions is benchmarking. Because the estimation of avoided transmission and distribution costs is difficult, many utilities use data from existing studies and often average the results. The reasoning behind this methodology is that avoided costs are likely to be similar in magnitude across utilities. Of course, the different studies show that there are a wide range of estimates depending on utility load growth, the constraints on the transmission and distribution system, and the methodology used to estimate the avoided costs.

Calculation Considerations

Within each methodology there are several variations and assumptions about the specific data. For example, the utility must consider if only the investment cost should be included in the marginal cost estimate or if an overhead adder or avoided O&M expenses should be included as well.

In addition, the utility must consider if the avoided T&D costs need to be de-rated. Some energy efficiency programs will not result in capacity savings in locations where the transmission and distribution systems are constrained. Therefore, T&D costs will only be reduced if a significant amount of load reduction is attained in an area where the utility expansion plans can be altered. Using a deration approach helps mitigate the risk of overvaluing DSM program peak reduction potential.

It should also be noted that, in some cases, the reduction in loads resulting from past DSM, rate structures, or natural changes in consumer loads lead to a case where there is surplus transmission and/or distribution capacity on the system. In this case there would not be any incremental savings in T&D costs associated with new DSM programs.

Estimated deferred T&D investments can vary considerably depending on the system condition, projected growth, and other factors the utility considers when determining how much of the investment is deferrable. At the most general level, estimates of avoided T&D costs are typically developed by dividing the portion of forecast T&D capital investments that are associated with load growth by the forecast growth in system load. As part of the analysis, T&D capital investments should exclude investments associated with replacement due to time-related deterioration or other factors that are independent of load.

Based on the review of methodologies, the following methodology best practices should be followed:

- Use methodology based on specific utility data available. Estimated deferred T&D investments can vary considerably depending on the utility system.

- Separate the calculation of transmission and distribution capital deferred expenditures and provide a DCE for each function if data is available.

- For each function (transmission and distribution) evaluate the potential on-peak impact of the potential conservation programs.

Literature Review

As part of this project, EES performed a literature search and examined the best practices for the methodology and resulting DCE factor used by a range of utilities in the U.S and Canada. The following sources were reviewed:

- BC Hydro's Integrated Resource Plan
- Ontario Power Authority (OPA)
- Hydro One
- Northwest Power and Planning Council, 7th Power Plan Methodology
- California Public Utility Commission Standard Practice
- Avoided Energy Supply Component (AESC) Study Group Report for New England
- Regulatory Assistance Project (RAP) Reports on Valuing Avoided Costs
- Regulatory filings and proceedings by several utilities

The findings related to the methodology used to determine T&D avoided costs for DSM evaluation and the resulting values are described below.

BC Hydro

BC Hydro is in the process of updating its conservation potential assessment. In the 2008 LTAP study performed, BC Hydro used the following values for avoided costs:[7]

- *Bulk transmission capacity:* $5 per kW-year between the Lower Mainland and Vancouver Island based on British Columbia Transmission Corporation (BCTC) estimates of the cost of incremental firm bulk transmission. Zero between the Interior and Lower Mainland because this cost is reflected in the avoided generation capacity cost. Zero between other regions because DSM is not expected to generate sufficient capacity savings in those regions to defer bulk transmission capacity investments.
- *Regional transmission capacity:* $30 per kW-year based on BCTC estimates of the cost of incremental regional transmission.
- *Distribution capacity:* $17-28 per kW-year, based on BC Hydro estimates of the cost of incremental distribution capacity in different regions of the province.

These values have been updated since then in the Amended F2012 to F2014 Revenue Requirements Application Updated DSM Plan,[8] the following assumptions were listed:

[7] Appendix K to BC Hydro's 2008 LTAP.

[8] BC Hydro Amended F12/F14 RRA – Amended New Appendix II, Attachment 6, p. 191 of 271.

- *Bulk transmission capacity:* $0 per kW-year ($ F2011) based on BC Hydro estimate because there are no bulk transmission capacity investments expected to be deferred by the Updated DSM Plan.
- *Regional transmission and substation capacity:* $11 per kW-year ($ F2011) based on BC Hydro estimate of the cost of the regional and substation capacity costs avoided by the Updated DSM Plan.
- *Distribution capacity:* $1 per kW-year ($ F2011), based on BC Hydro estimates of the distribution capacity cost avoided by the updated DSM Plan.

The methodology used to determine these avoided costs was not described.

Ontario Power Authority

The Ontario Power Authority has developed a cost effectiveness guide and model for Conservation and Demand Side Management (CDM) resources for use by Ontario's Local Distribution Companies (LDC). This model includes avoided transmission costs of $3.83 per kW-yr ($2014) and avoided distribution costs of $4.73 per kW-yr ($2014).[9]

Hydro One, Ontario

In the 2011 Integrated Power System Plan (IPSP), Hydro One used avoided costs to evaluate the cost effectiveness of the conservation resources proposed in the IPSP. The avoided costs were determined by using an incremental cost estimation method.[10] This methodology determined the transmission and distribution investments that could be avoided or deferred by CDM measures. The avoided transmission costs were estimated based on the magnitude of capital expenditures deferred, the deferral period, the cost of capital, the avoided annual operations and maintenance (O&M) costs, estimated at 1% of capital costs.

The annual avoided cost of transmission including both capital and operating costs were estimated at $5.40 ($2007) per kW of incremental demand at the time of the system peak load. Similarly, the avoided cost of distribution was estimated at $6.70 ($2007) per kW of incremental demand at the time of the system peak load. These incremental costs were re-evaluated, at a 4% real discount rate to be $3.40 per year for transmission and $4.20 per kW per year for Distribution.[11]

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[9] Ontario Power Authority, "Conservation and Demand Management Energy Efficiency Cost Effectiveness Guide" Final v1 - October 2014. P. 58.

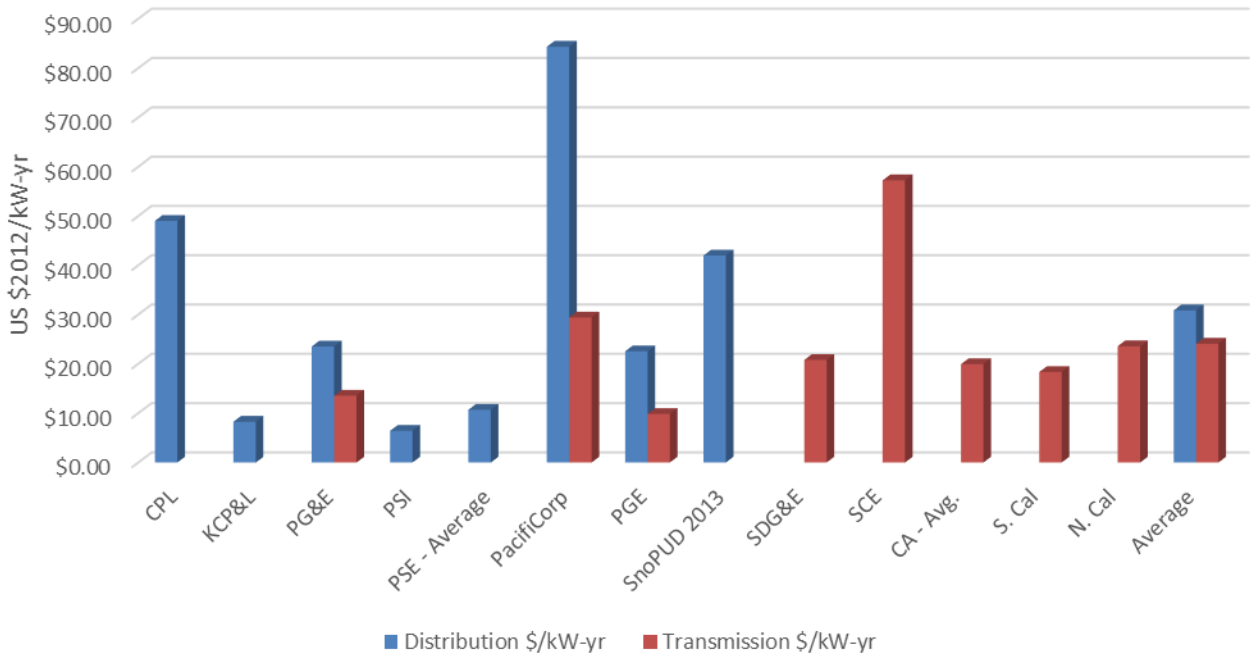
[10] Refer to EB-2007-0707, Exhibit D, Tab 4, Schedule 1, Attachment 15.

[11] Refer to EB-2007-0707, Exhibit D, Tab 4, Schedule 1, Attachment 3, p. 5 of 37.

Northwest Power and Planning Council, 7th Power Plan Methodology

The Northwest Power and Planning Council (Power Council) develops a power plan every five years to examine the power supply and cost-effective DSM potential in the States of Washington, Oregon, Idaho and Montana. Potential T&D avoided costs from investment in DSM is included in the determination of cost-effective DSM programs. The methodology used by the Power Council includes a benchmarking survey of the avoided T&D costs used by utilities from the Northwest and California, as well as benchmarking with data from outside the WECC region. Figure 1 provides the data from the Power Council survey escalated to 2012 dollars.[12]

Figure 1
Value of Deferred Capital Expenditure Survey – Pacific Northwest



The Power Council relied on the California data described below, as well as reported data from Northwest utilities. In addition, the distribution avoided costs were compared to regional data provided in the report *"Avoided Energy Supply Costs in New England: 2013 Report."*[13] The majority of the distribution cost information is based on 2006 data and then escalated. However, the estimate from Snohomish PUD was updated more recently.

[12] Costing Methodology for Electric Distribution System Planning.
[13] Hornby, Rick et al. (Synapse Energy Economics), *Avoided Energy Supply Costs in New England: 2013 Report*, prepared for the Avoided Energy Supply Component (AESC) Study Group, July 12, 2013.

In the recent update, Snohomish PUD developed their deferred distribution costs by determining the major upgrades and major expansion costs over a forecasted 7-year period. Next, the total value of forecasted distribution investments was divided by the forecasted peak growth. After annualizing using 5% borrowing rate over a 35-year life of assets, this methodology resulted in a $42/kW-yr deferred value.

The resulting survey shows significant differences in transmission and distribution deferred value across utilities. The standard deviations for the sample data is $26.59 (86%) for distribution and $14.65 (61%) for transmission.

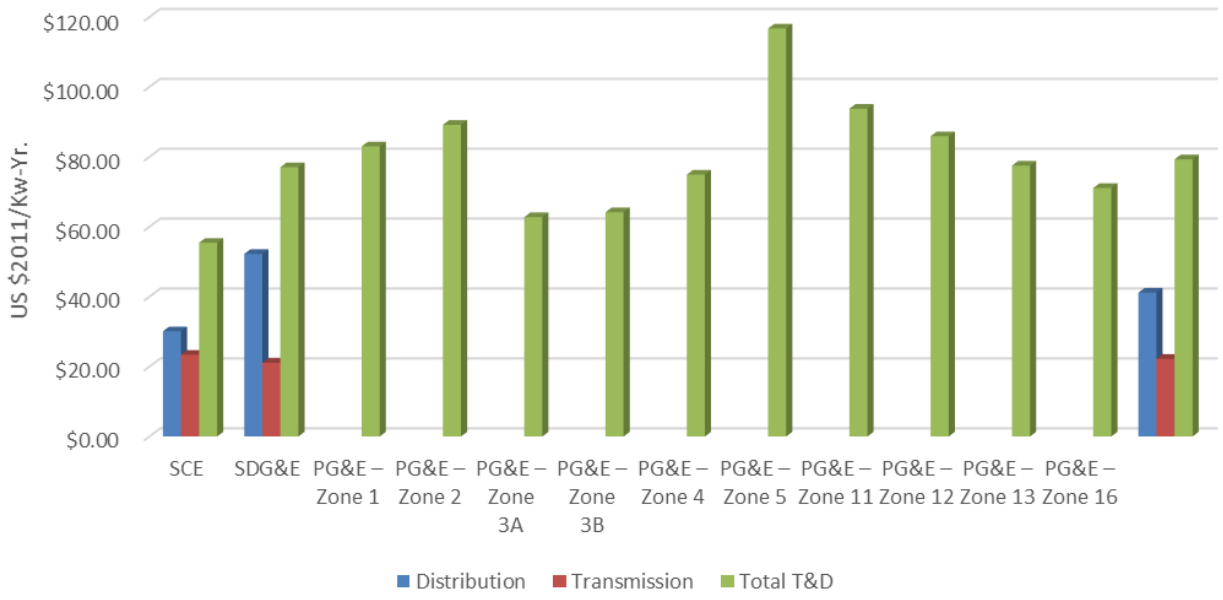
California Public Utilities Commission (CPUC) Standard Practice

The CPUC has adopted a calculator for use by the Investor Owned Utilities (IOUs) in California to report on the cost-effectiveness of DSM programs. This model takes the marginal T&D cost determined in the IOUs' cost of service studies and uses these values to determine the avoided costs for DSM program evaluations.

The general methodology used by the utilities to develop the marginal T&D costs for the Cost of Service studies is based on forecasted investment data, forecasted load increases, and the addition of any general plant loading factor plus an avoided O&M adder. Because the avoided costs depend upon area-specific capacity conditions, the Pacific Gas & Electric (PG&E) model forecasts electric T&D avoided costs by climate zone and is based on the hours of the year that are the most likely drivers of the local peak demand. Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E) calculate the utility average T&D marginal cost.

Figure 2 displays the weighted average annual T&D avoided costs for SCE, PG&E and SDG&E from the most recent study.

Figure 2
Value of Deferred Capital Expenditure - California



New England AESC Study

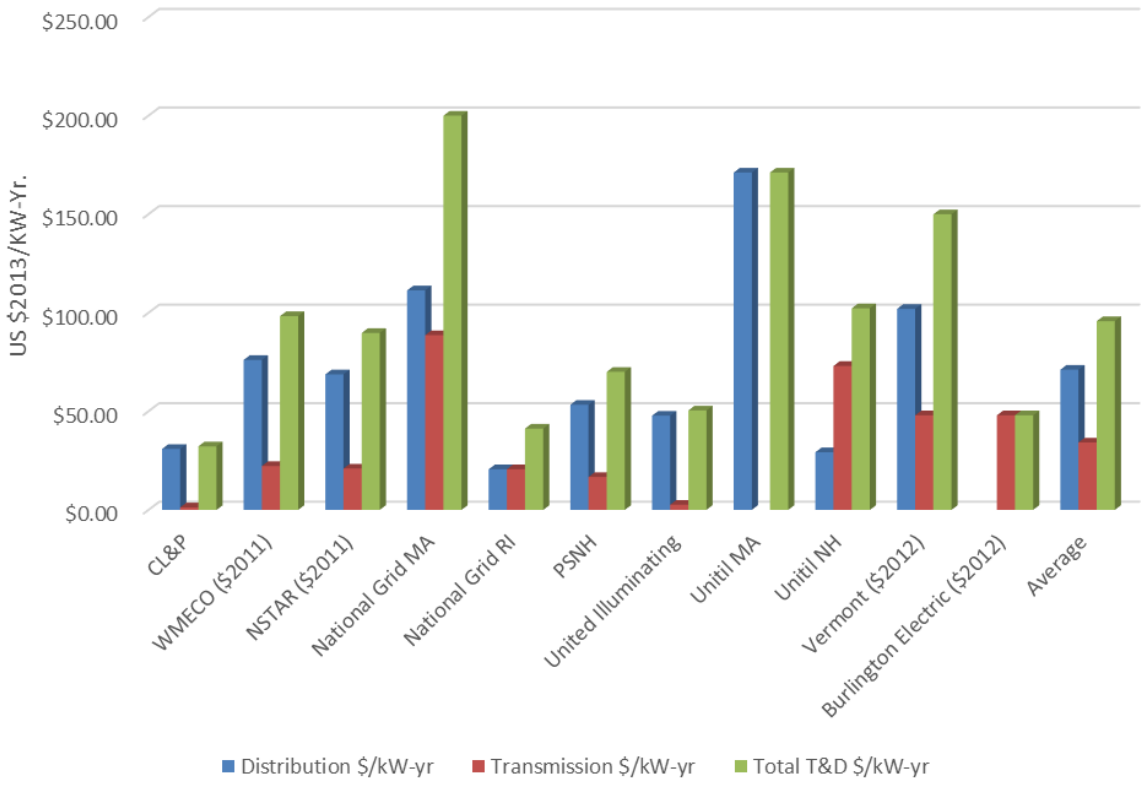
The Avoided Energy Supply Component (AESC) Study Group released the Avoided Energy Supply Cost in New England: 2015 Report.[14] The AESC provides estimates of avoided costs for program administrators throughout New England to support their internal decision-making and regulatory filings for DSM program cost-effectiveness analysis. As part of the avoided cost calculation, the AESC provides estimates of avoided T&D costs for several utilities in the region.

In 2013, the utility estimates of avoided T&D costs ranged from about $30 per kW-year (Connecticut Light & Power (CL&P)) to about $200 per kW-year (National Grid –Massachusetts) USD.[15] Figure 3 provides the estimated T&D Deferred Capital Expenditures from the 2013 Study.

[14] http://ma-eeac.org/wordpress/wp-content/uploads/2015-Regional-Avoided-Cost-Study-Report1.pdf.

[15] Hornby, Rick et al. (Synapse Energy Economics), *Avoided Energy Supply Costs in New England: 2013 Report*, prepared for the Avoided Energy Supply Component (AESC) Study Group, July 12, 2013.

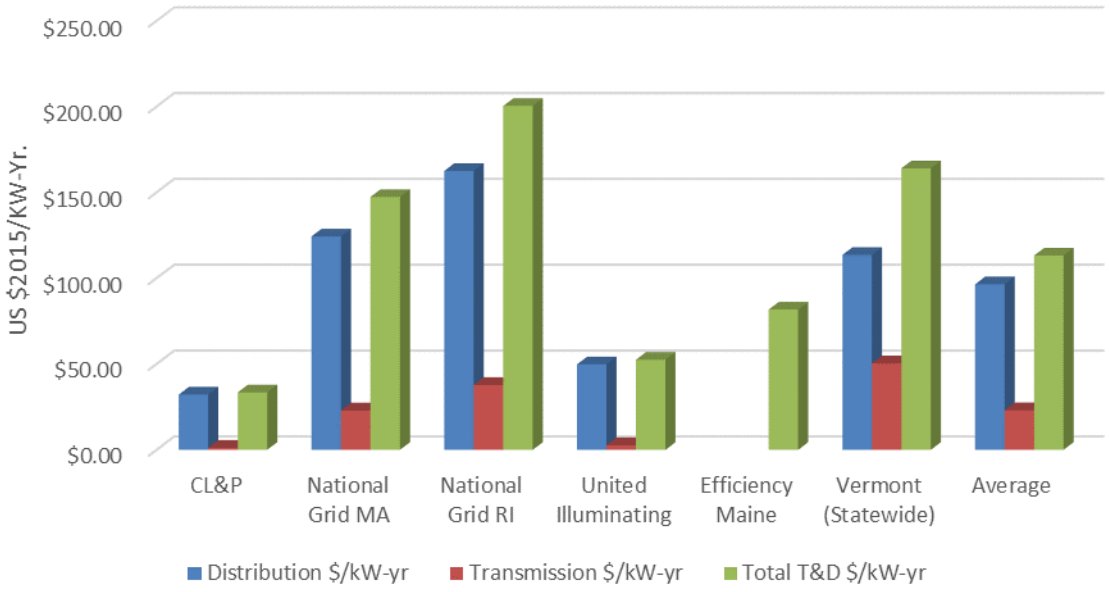
Figure 3
Value of Deferred Capital Expenditure – New England 2013*



*In $2013 unless noted.

For the 2015 study, the AESC 2015 project team issued a survey to the sponsoring electric utilities requesting the estimates of avoided Transmission and Distribution costs they use in their analysis of efficiency measure cost-effectiveness tests. The 2015 update resulted in a similar range of results as can be seen in Figure 4.

Figure 4
Value of Deferred Capital Expenditure – New England 2015



These estimates of avoided T&D costs were generally developed by dividing the portion of forecast T&D capital investments that are associated with load growth by the forecast growth in system load. These T&D investments exclude investments associated with replacement due to time-related deterioration or other factors that are independent of load. Such estimates vary considerably often as a function of the utilities' assumptions regarding how much investment is deferrable. More detail on the methodology used to develop the T&D estimates for some of the utilities is provided below.

Vermont

In 2012, the Vermont distribution utilities and Department of Public Service jointly reviewed and updated avoided T&D costs and filed those estimates with the Vermont Public Service Board. [16] The statewide estimates are based on load-related investments in the last decade ending in 1996 for which Vermont experienced significant load growth. The statewide avoided costs are reduced to reflect the reduction in line losses that would be associated with increasing T&D capacity. The annual avoided T&D costs start at $159/kW-year in 2013 and decline gradually resulting in a real-levelized value of $150/kW-year over a 29-year period

[16] Docket EEU-2011-02 – EEU Avoided Costs – T&D Component Working Group Recommendation, August 31, 2012 http://psb.vermont.gov/docketsandprojects/eeu/avoidedcosts/2011, Order Re EEU Avoided Costs for Transmission and Distribution.

($2012 US). For 2015, the total avoided T&D cost was deemed at $150/kW-yr in $2012, which resulted in $164/KW-Yr in $2015 according to the updated AESC Study.

Burlington Electric

The Burlington Electric Department expects that no load-related distribution investments would be required over the next 20 years even without energy-efficiency programs, and, therefore, only uses the Vermont statewide avoided transmission cost.

ICF Tool

The ICF Tool is a workbook developed by ICF Consultants as part of the 2005 Avoided Energy Supply Component (AESC) Study and was most recently updated by ICF in 2009. The inputs for the workbook are:

- Historical and budgeted future capital costs,
- Historical and future load, and
- Various accounting parameters from FERC Form 1 data.

Analysis period cost data is divided by analysis period load data to derive an average capital cost per kW-yr. This average cost is multiplied by a factor representing the percentage of capital costs that are avoidable with DSM (another input variable). The model provides default avoidable percentages that are based on ICF's expert judgement and have been accepted by the AESC study group participants. The avoidable $/kW-yr is further modified by a carrying charge, determined from the accounting inputs, to develop an annualized avoided capacity value in $/kW-yr.

Based on review of some of the carrying charge calculations in the AESC 2009 study, National Grid updated this part of the workbook to create the updated ICF Tool. Other utilities have updated the workbook at other intervals. National Grid indicated that its practice is to use five years of historical and forecast data for both transmission and distribution data in developing the avoided transmission and distribution capacity values.

United Illuminating (B&V Report)

United Illuminating's methodology (B&V Report) is the following:

- Identification of historical and future T&D capacity additions which could have been fully or partially avoided with additional DSM programs.
- Collection of historical costs plus AFUDC associated with projects identified in the first step. Calculated project costs are then divided by each project's incremental MW load carrying capacity to derive a marginal capital cost for capacity per MW.

- Calculation of marginal O&M expenses.
- Converting marginal capital costs to annual costs adjusting for revenue requirements based on accounting inputs.
- Calculation of DSM savings based on historical and projected load growth.
- Calculations of annual avoided cost based on annual costs and identified DSM savings.

New England AESC Study Summary

Table 1 summarizes the methodology or tool used by the New England utilities using information from both the 2013 and 2015 AESC studies.

Table 1
Summary of New England Electric Utilities – Methodology

Company	Methodology
CL&P	ICF Tool
WMECO	ICF Tool
NSTAR	ICF Tool
National Grid MA	ICF Tool
National Grid RI	ICF Tool
PSNH	ICF Tool
United Illuminating	B&V Report
Efficiency Maine	Historical
Unitil MA	ICF Tool
Unitil NH	ICF Tool
Vermont (Statewide)	Historical
Burlington Electric Department	Historical

Notes
NA= Not applicable
ICF Tool = ICF workbook developed in 2009.
B&V Report = United Illuminating Avoided Transmission & Distribution Cost Study Report, Black & Veatch, September 2009.

When examining the results from the New England AESC study, it is important to recognize that the T&D DCE estimates are for utilities located outside WECC. Customer usage patterns, DSM programs and transmission and distribution systems constraints are different outside WECC than what is faced by FortisBC. While the general calculation methodology can be applied, it is unlikely that these estimates from the AESC study can be used by FortisBC to accurately reflect T&D DCE.

Michigan

In Michigan, the avoided transmission and distribution costs included in DSM cost-effectiveness analysis are specific to each utility and are generally relatively low. For example, Consumers Energy has noted that the current utility system structure would need to change substantially before the cost of building new transmission and distribution could be avoided. In its 2011 benefit cost analysis, the company used a $5/kW-yr figure for the T&D avoided cost value. This value essentially reflects reduced maintenance costs and does not represent changes in infrastructure costs.[17]

Illinois

The Ameren Illinois Company (AIC) separates the calculation of avoided transmission and distribution into two separate calculations.[18] The methodology used to estimate avoided distribution costs attributable to DSM programs involved estimating projected system load growth and estimate marginal cost of system capacity. Distribution engineering review a variety of bulk substation and distribution substation projects to determine an average marginal cost of capacity expansion. Typical costs for distribution circuit construction and line transformers were included. Next, the expenditures to serve load growth were estimated by evaluating budget information for an extended period. This evaluation is complicated by the fact that projects serve a variety of purposes: capacity upgrades to serve incremental system load, capacity upgrades to serve relocated system load, and refurbishment or replacement of equipment to avoid imminent failure.

The avoided electric transmission costs were estimated by using three factors:

- "Usage Growth-Related Factor." This factor is designed to capture the effect that some of the transmission projects may not be deferrable from DSM because it is not driven by growth in usage, but rather it is driven by customers moving to different areas. In this case, there is local growth but not system wide growth.

- "Location-Specific Factor/Deferrable Factor." This factor captures the effect that AIC is looking at the system as an aggregate and cannot tell whether load pockets will be deferred by DSM programs. Since DSM programs are not being designed to avoid or offset specific transmission projects, there is no certainty as to which projects will actually be deferred.

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[17] Consumers Energy 2012. Consumers Energy Company, "Consumers Energy 2011 Energy Optimization Annual Report," Case No. U-16736, May 31, 2012, available at: http://efile.mpsc.state.mi.us/efile/docs/16736/0001.pdf p.19.

[18] Ameren 2013b. Ameren Illinois, "Electric and Gas Energy Efficiency and Demand-Response Plan, Program Years: June 1, 2014 – May 31, 2017 (Plan 3)," Case No. 13-0498, August 30, 2013, available at: http://www.icc.illinois.gov/docket/CaseDetails.aspx?no=13-0498. Pp 27-29.

- "Condition/Reliability Replacement Factor." This factor approximates the effect that load growth projects cause transmission asset turnover, so if AIC does not upgrade or replace a substation because of DSM, then AIC will need to spend money on additional maintenance or reliability projects that would have been avoided had new equipment been installed to meet load growth.

This methodology resulted in avoided transmission costs of $6/kW-yr and avoided distribution costs of $17/kW-yr in $2014.

NV Energy

The methodology for quantifying T&D capital investment savings generated by DSM energy savings is based on the marginal cost study filed in Nevada Power's last general rate case.[19] The adopted valuation process reduces potential difficulties regarding uncertainty in load forecasts and T&D construction budgets, and it takes into account the ripple effect or the effect of deferred construction investments during the useful life of DSM measures.

The annual revenue requirement for the marginal cost of transmission facilities and distribution substations is estimated at US $48.92 /kW-yr. NV Energy has utilized the conservative value of 25 percent of $48.92/kW or $12.23/kW-yr in the PortfolioPro cost/benefit model. The PortfolioPro model calculates peak demand savings for each year of the measure useful life and then multiplies annual revenue requirement per kW with the peak demand savings to come up with the annual avoided revenue requirement.

Public Service Company of Colorado 2010 DSM Case

In the 2010 DSM analysis, the Public Service Company of Colorado used a combined value of $30.00/kW-yr for 2007 avoided transmission and distribution escalating at 1.99 percent annually. This estimate was developed as part of a resource planning settlement in the Comanche 3 Settlement Agreement in Docket Nos. 04A-214E, 04A-215E and 04A-216E. No background on the calculation method was provided.

[19] Docket No. 11-06006.

Summary of Survey

Table 2 below summarizes the methodologies used by utilities or entities in the regions reviewed for literature research. The most common valuation approach is the marginal cost methodology.

Table 2
Summary of T&D Avoided Cost Methodologies in Practice

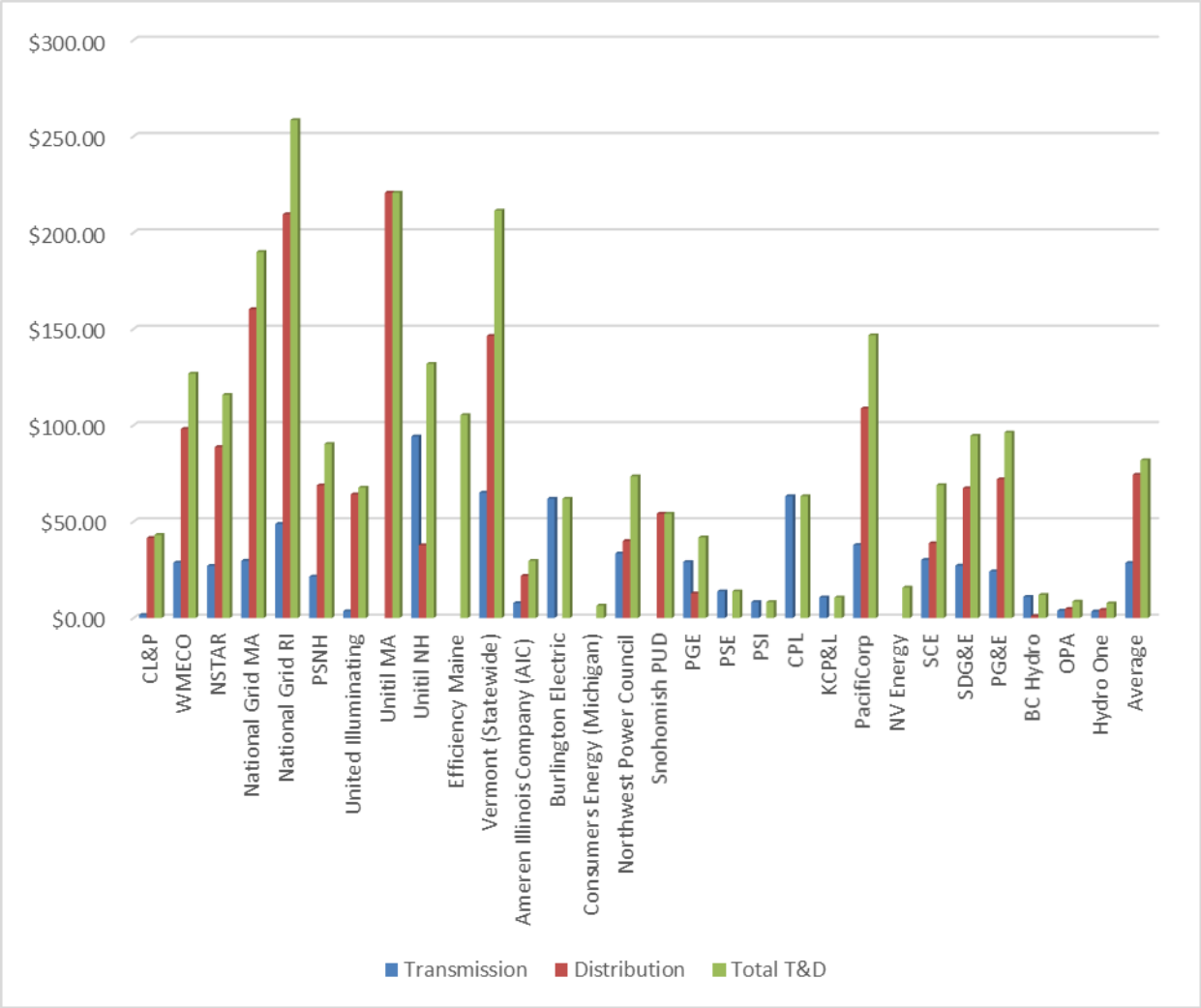
Entity/Region	Marginal Cost	Average Cost	Market Value	Scenario	Bench-marking
BC Hydro	■				
Ontario Power Authority	■				
Hydro One	■				
Northwest Power Council					■
Snohomish PUD	■				
CPUC	■				
New England AESC Study	■				
Vermont		■			
ICF Tool		■			
United Illuminating	■				
Michigan	■				
Illinois	■				
NV Energy	■				
Public Service Company Colorado			■		

Figure 5 summarizes the estimated deferred T&D costs from the studies cited in this section in 2015 Canadian dollars. Appendix A containing a summary table of all the estimated DCE. The average, high and low DCE by function are provided in Table 3 below for the full survey and for utilities in WECC.

Table 3
Survey Results (CA$)

	Transmission	Distribution	Total T&D
Average			
All Utilities	$28.60	$74.39	$81.93
WECC	$20.23	$40.39	$52.20
High			
All Utilities	$94.21	$220.78	$258.43
WECC	$37.95	$108.81	$146.76
Low			
All Utilities	$1.61	$1.00	$7.60
WECC	$5.13	$1.00	$6.45

Figure 5
Value of Deferred Capital Expenditure – 2015 CA$



Based on the survey of methodology and DCE results, the following best practices can be concluded:

- Calculate separate estimates for Transmission and Distribution.
- Results differs by region and utility. Therefore, the best option for FortisBC is to estimate T&D DCE based on FortisBC data.
- While benchmarking may be indicative, benchmarking DCE results for FortisBC outside WECC does not appear to be appropriate.
- Using a marginal costing approach appears to be the most common calculation methodology.

Updated DCE Calculation

Introduction

As a fundamental principle, the avoided T&D costs included in a utility's DSM screening test should fairly represent the potential reduction or deferral in capital investments in the transmission and distribution system due to the addition of DSM programs. It is important to consider if the specific DSM programs are likely to reduce peak demand and, therefore, capital investments. While the averages of other utilities are useful for comparison purposes, FortisBC can develop more utility-specific numbers using data already published and available.

A sound avoided cost calculation practice should:

- Be based on forward looking avoided costs
- Be separated into two calculations: one for distribution and one for transmission
- Be annualized based on the cost of capital of FortisBC
- Reflect avoided O&M expenses, if any
- Consider the likelihood that reduction in capacity from DSM programs would occur during constrained periods and in locations that are constrained

Based on the survey of other utilities, a proposed methodology for FortisBC is provided below.

Proposed Calculation Methodology

The following methodology is proposed for FortisBC based on the review of methodologies used by other utilities. The proposed methodology is a marginal costing approach incorporating the forecast capital investments for FortisBC. In addition, it is based on forecasted data, rather than historical, to ensure the calculation captures capital expenditures that could be deferred, not investments already made. This methodology also allows FortisBC to use load forecasts and system investments that have already been published to the extent possible. In addition, the carrying costs calculations should be calculated from the most recent revenue requirements.

Distribution Avoided Costs

- Determine analysis period
- Determine expected peak growth over the analysis period
- Determine the forecasted distribution system investments due to growth over the analysis period
  - Exclude capital investments needed to support current load
  - Exclude capital investments needed to repair or replace current equipment
  - Exclude new connection capital costs
- Calculate the annualized $/kW-yr avoided distribution cost as the avoided investment divided by load growth times a real carrying charge
- If applicable add avoidable general plant and O&M adders

Transmission Avoided Costs

- Determine analysis period
- Determine expected peak growth over the analysis period
- Determine the forecasted transmission system investments due to growth over the analysis period
  - Exclude capital investments needed to support current load
  - Exclude capital investments needed to repair or replace current equipment
  - Exclude new connection capital costs
- Calculate the annualized $/kW-yr avoided transmission cost as the avoided investment divided by load growth times a real carrying charge
- Review the proposed programs and determine if a de-ration factor needs to be applied

Resulting DCE values

Based on the methodology described above, the following levelized transmission and distribution deferred capital expenses were determined, as shown in Table 4.

Table 4 Estimated Capital Deferred Value			
	Transmission	**Distribution**	**T&D**
Avoided Investment ($/kW-Yr)	$686.08	$131.30	$817.38
Annualized DCE			
Avoided Annual Return (6.00%)[20]	$41.16 per kW	$7.88 per kW	$49.04 per kW
Avoided Depreciation (2.54%)[21]	$17.44 per kW	$3.34 per kW	$20.78 per kW
Avoided Taxes (1.23%)[22]	$8.42 per kW	$1.61 per kW	$10.03 per kW
Avoided O&M (0.00%)[23]	$0.00 per kW	$0.00 per kW	$0.00 per kW
Total DCE	$67.03 per kW	$12.83 per kW	$79.85 per kW

FortisBC needs to consider if the avoided T&D costs need to be de-rated. Specifically, T&D costs will only be reduced if a significant amount of load reduction is attained in an area where the utility expansion plans can be altered. Using a deration approach helps mitigate the risk of overvaluing DSM program peak reduction potential.

Summary

The recommended Marginal Cost methodology was selected based on the literature review of the common methodologies used to determine avoidable T&D expenditures due to DSM program implementation. The methodology requires a utility-specific analysis of the growth on both the distribution and transmission system, an analysis of the investments needed to meet growth and a consideration of how potential DSM measures can impact the growth in the distribution and the transmission systems. Based on FortisBC's forecast growth-related capital T&D expenditure schedules and annualizing factors obtained from FortisBC, this study found the levelized T&D DCE values to be $67.03 and $12.83 respectively in 2015 dollars. Annual values for use in the DSM evaluation studies can be calculated by increasing these values by inflation on an annual basis.

[20] Annual Return Factor is provided by FortisBC staff.

[21] The depreciation expense factor is based on the estimate life by cost category for transmission and distribution facilities.

[22] The taxes factor is based on the 2015 Approved property taxes as percent of total utility rate base

[23] The O&M factor is set to zero, since the O&M budget does not change under PBR, except for inflationary/productivity adjustments that are not related to capital expenditures.

Appendix A

Summary table of the estimated DCE values from review of other utilities.

		U.S. $			Canadian $[24]			
Company	**Year $**	**Trans. $/kW-yr.**	**Dist. $/kW-yr.**	**Total T&D $/kW-yr.**	**Trans. $/kW-yr**	**Dist. $/kW-yr**	**Total T&D $/kW-yr.**	**Methodology**
BC Hydro	2011				$11.00	$1.00	$12.00	
OPA	2014				$3.83	$4.73	$8.56	Marginal Cost
Hydro One	2007				$3.40	$4.20	$7.60	Marginal Cost
Northwest Power Council	2012	$26.00	$31.00	$57.00	$33.54	$39.99	$73.53	Benchmarking
Snohomish PUD	2013	N/A	$42.00	$42.00	N/A	$54.18	$54.18	Marginal Cost
PGE	2012	$22.56	$9.87	$32.43	$29.10	$12.73	$41.83	Unknown
PSE	2012	$10.71	N/A	$10.71	$13.82	N/A	$13.82	Unknown
PSI	2012	$6.43	N/A	$6.43	$8.29	N/A	$8.29	Unknown
PacifiCorp	2012	$29.42	$84.35	$113.77	$37.95	$108.81	$146.76	Unknown
Pacific Northwest Average		**$19.02**	**$41.81**	**$43.72**	**$17.62**	**$53.93**	**$40.73**	
Standard Deviation		**$8.91**	**$27.14**	**$35.81**	**$11.49**	**$35.01**	**$46.19**	
Standard Deviation (%)		**47%**	**65%**	**82%**	**65%**	**65%**	**113%**	
CL&P	2015	$1.25	$32.19	$33.44	$1.61	$41.53	$43.14	ICF Tool
WMECO	2011	$22.27	$76.08	$98.35	$28.73	$98.14	$126.87	ICF Tool
NSTAR	2011	$21.00	$68.79	$89.79	$27.09	$88.74	$115.83	ICF Tool
National Grid MA	2015	$23.01	$124.28	$147.29	$29.68	$160.32	$190.00	ICF Tool
National Grid RI	2015	$37.86	$162.47	$200.33	$48.84	$209.59	$258.43	ICF Tool
PSNH	2013	$16.70	$53.35	$70.05	$21.54	$68.82	$90.36	ICF Tool
United Illuminating	2015	$2.74	$49.75	$52.49	$3.53	$64.18	$67.71	B&V Report
Unitil MA	2013	N/A	$171.15	$171.15	N/A	$220.78	$220.78	ICF Tool
Unitil NH	2013	$73.03	$29.26	$102.29	$94.21	$37.75	$131.95	ICF Tool
Efficiency Maine	2015	N/A	N/A	$81.67	N/A	N/A	$105.35	Unknown
Vermont (Statewide)	2012	$50.45	$113.51	$163.96	$65.08	$146.43	$211.51	Historical
Ameren Illinois Company (AIC)	2014	$6.00	$17.00	$23.00	$7.74	$21.93	$29.67	Marginal Cost
Burlington Electric Dept.	2012	$48.00	N/A	$48.00	$61.92	N/A	$61.92	Historical
Consumers Energy (MI)	2011	N/A	N/A	$5.00	N/A	N/A	$6.45	Proxy
CPL	2012	$49.02	N/A	$49.02	$63.24	N/A	$63.24	Unknown
KCP&L	2012	$8.28	N/A	$8.28	$10.68	N/A	$10.68	Unknown
NV Energy	2011	N/A	N/A	$12.23	N/A	N/A	$15.78	Marginal Cost
SCE	2011	$23.39	$30.10	$53.49	$30.17	$38.83	$69.00	Marginal Cost

[24] Exchange rate used:1 US Dollar equal 1.29 Canadian Dollar (07/05/2016)

		U.S. $			Canadian $[24]			
Company	**Year $**	**Trans. $/kW-yr.**	**Dist. $/kW-yr.**	**Total T&D $/kW-yr.**	**Trans. $/kW-yr**	**Dist. $/kW-yr**	**Total T&D $/kW-yr.**	**Methodology**
SDG&E	2011	$21.08	$52.24	$73.32	$27.19	$67.39	$94.58	Marginal Cost
PG&E	2011	$18.77	$55.85	$74.62	$24.21	$72.05	$96.26	Marginal Cost
Average		**$24.67**	**$66.85**	**$70.00**	**$28.60**	**$74.39**	**$81.93**	
Standard Deviation		**$17.60**	**$45.81**	**$52.11**	**$22.71**	**$60.58**	**$67.85**	
Standard Deviation (%)		**71%**	**69%**	**74%**	**79%**	**81%**	**83%**	

Appendix D

DRAFT ORDER

British Columbia Utilities Commission

Sixth floor, 900 Howe Street
Vancouver, BC Canada V6Z 2N3
TEL: (604) 660-4700
BC Toll Free: 1-800-663-1385
FAX: (604) 660-1102

ORDER NUMBER
G-xx-xx

IN THE MATTER OF
the *Utilities Commission Act*, RSBC 1996, Chapter 473

and

FortisBC Inc.
Application for Acceptance of Demand Side Management Expenditures for 2017

BEFORE:
Panel Chair/Commissioner
Commissioner
Commissioner

on Date

ORDER

WHEREAS:

A. By way of the British Columbia Utilities Commission (Commission) Decision and Order G-186-14, dated December 3, 2014, the Commission accepted the FortisBC Inc. (FBC) Demand Side Management (DSM) expenditures for the period from 2015 to 2016;

B. In its Decision, the Commission Panel encouraged FBC to file its next multi-year DSM expenditure schedule after the Commission's review and decision on the 2016 Long Term Resource Plan (LTRP). The Commission also recognised that there may be insufficient time between FBC's LTRP decision and the end of 2015 to obtain acceptance of a new DSM expenditure schedule. In that case, the Commission Panel encouraged FBC to file for acceptance of a shorter DSM period (i.e. for 2017 only) in order to bridge the gap;

C. On August 8, 2016, FBC filed with the Commission, an Application for Acceptance of DSM Expenditures for 2017 (the Application), for up to $7.6 million in 2017.

D. The Commission has reviewed and considered the Application and determines that the Application should be accepted.

NOW THEREFORE the British Columbia Utilities Commission orders as follows:

1. Pursuant to section 44.2(3) of the *Utilities Commission Act*, the FortisBC Inc. Demand Side Management expenditure schedules in Appendix A of the Application setting out expenditures of up to $7.6 million for 2017 are accepted.

DATED at the City of Vancouver, in the Province of British Columbia, this (XX) day of (Month Year).

BY ORDER

(X. X. last name)
Commissioner

Attachment (Yes? No?)